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ABSTRACT

This teacher's manual is arranged according to the four major categories that were identified as being necessary for a good foundation to an agricultural education program. Each section includes background information and activities for classroom use. Activities were designed to assist teachers in developing lesson plans for grades 4, 5, and 6; however, many of the activities can be adapted to other age groups. Activities include: (1) "People and the Environment"; (2) "Change and Continuity"; (3) "Making a Living"; (4) "Agriculture and Technology"; and (5) "Building on the Past--Looking toward the Future." Includes a resource list for agricultural education. (CCM)

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Food for Thought

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A Teachers' Resource Guide from Connecticut Ag in the Classroom

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Steering Committee, 1999

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Acknowledgments

This Teachers' Resource Manual was written to assist Connecticut educators in developing and implementing instruction on agriculture and related issues. It was developed by the Steering Committee of Connecticut Agriculture in the Classroom and was originally published in 1987.

Connecticut Agriculture in the Classroom
Steering Committee, 1987

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Foreword

"History celebrates the battlefields whereon we meet our death, but scorns to speak of the plowed fields whereby we thrive. It knows the names of the kings' (illegitimate children) but cannot tell us the origin of wheat. This is the way of human folly."

This paraphrased poem, written by J. H. Fabre, expresses the attitude and understanding that many possess of agriculture. So often we hear from young people that milk comes from cartons or vegetables from the grocery store. Fewer and fewer people truly have an appreciation for what is involved in the production of food for our tables or fiber for our shelter and clothing.

America has truly been a land of plenty. The superior productivity of American agriculture has allowed our citizens the freedom to pursue other ventures, assured that their food and other raw materials would be amply supplied. Our agriculture has certainly been a major contributor to the success and greatness of our country.

Now, with less than two percent of the population employed in production agriculture, our society has grown away from its agrarian rots and is loosing a fundamental understanding and appreciation for food and fiber systems. As part of our estate to our children, it is critical that we leave them with a knowledge of the earth, how to care for it and how to obtain its bounties. From the traditions of agricultural history to the findings of the latest science, all of the information is valuable to the sustenance of the next generation. It continues to be the mission of Connecticut Agriculture in the Classroom to improve the agricultural literacy of the residents of our state by providing materials and teacher education to elementary school educators.

It is with great pleasure that we introduce the most recent edition of our teachers' resource manual entitled **Food for Thought.** We hope that it is a resource that will help you to include more information about Connecticut's food and fiber industry into your existing curriculum. The book has been designed to provide you with material that you might find useful in lessons you already teach. Once you begin, we believe you will be excited by the great possibilities.

Mark R. Grillo
Chairman, CAITC Steering Committee

Preface

Connecticut Agriculture in the Classroom is part of a national program. The mission of Ag in the Classroom is to help students acquire the knowledge needed to become agriculturally literate. The objective of Ag in the Classroom is to encourage educators to teach more about our food and fiber system and the critical role of agriculture in our economy and society. Emphasis is placed on incorporating the following into the curriculum that is already being taught in schools.

Agriculture and History

Agricultural issues or events as major influences in human history, from making possible the first settled societies, to current world food issues.

The Geography of Agriculture

Discovery of how climate, altitude, soil types and societal preferences influence what and where elements of the food and fiber system are grown.

Agricultural Science and Technology

How science and technology have changed American agriculture in the last 100 years.

Agricultural Economics

How the agriculture sector works and relates to the national and international economy. Effects of supply and demand on pricing and product; the factors of production regarding food safety and environmental stewardship; the business aspects of production farming and related agribusiness.

Agriculture and the World

World Food production and distribution and its relationship to American agriculture.

Careers

The abundant opportunities for challenging and rewarding careers in agriculture and related industries.

Agriculture and Public Policy

Land use conservation, biotechnology, environmental quality, world food supplies and other issues.

This Teachers' Manual is arranged in four major categories that have been identified as being necessary to a good foundation for a program of agricultural education. Each section includes background information and activities for classroom use. The activities were designed to assist teachers with developing lesson plans for grades 4, 5 and y. Many of the activities, however, can be adapted for other age groups.

Introduction

Do you know where your next meal is coming from?

In Connecticut and across the United States, we tend to take our food for granted. Food is plentiful. Our supermarkets are well-stocked with a variety of high-quality food products.

Most of us are not actively involved in farming. Someone else grows our vegetables and fruits. Someone else raises our livestock and poultry. As long as food reaches our tables in a steady flow, agriculture doesn't seem to have much relevancy to our everyday lives.

Though only two percent of the population is engaged in producing our food, agriculture indirectly provides one out of every six jobs in the nation. Agriculture is the biggest business in the country. Even in the small state of Connecticut, agriculture is a $2.1 billion industry.

Agriculture includes everything from the farmer growing the apple you eat, to the veterinarian caring for the sick cow, to the plant researcher at the university, to the nursery specialist at your local garden center. Agriculture offers a host of career opportunities for the trained person, in many jobs other than food production.

In production, the modern farmer needs a working knowledge of business principles, marketing, computers, mechanics, plumbing and construction, in addition to plant science and animal health nutrition. These skills are essential if the farmer is to survive and compete.

Young people will need the educational tools to develop new production methods through science and technology. They will need practice in leadership and problem solving, so they can find solutions to complex land use problems. They will need to carefully balance environmental issues with human needs and economic concerns. Today's students need to understand that agriculture impacts everyone, every day.

People and the Environment

Before the development of agriculture, people spent most of their time hunting for animals or gathering wild plants to provide food for their families. As time passed, they learned how to work with their environment to increase food supplies and allow time for other activities. Now people rely on farmers to produce almost all of their food. Farmers raise livestock and crops to feed an expanding population.

Farming methods are determined by the terrain and productivity of the land. In order to make wise decisions about land use, the farmer must have an understanding of geography. Farmers also must understand the ecology of the farm and the interrelationships among all life.

The farm provides more than food. It provides open space, wildlife habitat and scenic vistas.

Farmers have an interest in protecting our environment because land and water resources provide their livelihood.

I. Living by the Skin of the Apple:

Introduction

In this activity, students will study soil to determine its impact on agriculture.

Soil is one of the most important natural resources. Living things depend on soil to produce food.

The amount of food-producing land remains the same or decreases while the world population continues to grow. As land is developed, less is available for farming. It is the responsibility of each generation to use the soil wisely to ensure adequate food production for future generations.

Objectives

Students will:

- Understand how little of the earth's surface is suitable for farming
- Recognize the importance of preserving topsoil
- Recognize how humans must safeguard the delicate balance of nature.

Background

What do you see in a handful of soil? Did you know there are millions of living and nonliving things in one little handful?

Soil is a mixture of air, water, rock particles, dead plants and other organic matter. The rock particles may be large or small. Various types of soil result from different mixtures of these soil components.

Some species of plants prefer a particular kind of soil. For example, certain soils are better for trees than for crops or for grass than trees. A farmer either has to grow the crops best suited to the soil or change the soil to suit the plants.

Soil varies with location. There can even be soil variation within a single farm. Soil scientists map the soil for the farmer and help him or her decide which crops grow best in each kind of soil.

There are thousands of different kinds of soil in the United States, and each has its own characteristics. Connecticut has a variety of soils as well. In general, the soils in Connecticut are productive and well-suited to growing crops and trees, particularly in the Connecticut River Valley.

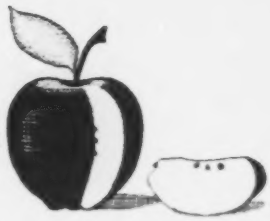
Vocabulary

topsoil, earth, crop, population, ocean, land, deserts, swamps, antarctic, arctic, mountains, rocky

Materials

One large apple (soft apples work best)
One paring knife

The Role of Soil in Crop Production



Procedure

Students will cut the apple into four equal parts. Three of the parts will represent the oceans of the world. The fourth part will represent the world's land areas. Students will then cut the land section in half length-wise. They will have two one-eighth pieces. One section represents land such as deserts, swamps, antarctic, arctic and mountain regions. Set this section aside.

The other one-eighth section represents the land most humans inhabit.

Students take this one-eighth section and slice it into four equal parts. Three of these one-thirty-second sections represent the areas of the world that are not suitable for food production. These areas are too rocky, too wet or too hot. The soil is too poor in quality for food production, or the area has been developed by people and is no longer available for agricultural use.

The teacher then will ask students to carefully peel the last one-thirty-second section and will explain that this small bit of peel represents the soils of our Earth on which humans depend for food production.

Going Further

Students might study maps to determine locations that are suitable for food production in Connecticut, in the United States and in the world.

Notes:

II. Counting on Rain:

Introduction

Water is essential to life on Earth. The Earth's water supply is replenished through rainfall. In the following activity, students will create a rain gauge to measure the rainfall on their school property.

Objectives

Students will:

- See the pattern of rainfall over an eight-month period
- Observe seasonal fluctuations and become aware of how rainfall patterns correspond to the growing seasons

Background

Water is one of the most common substances on Earth. Nearly three-quarters of the Earth's surface is covered with seawater. Life on Earth depends on water to sustain it. The composition of our own bodies is two-thirds water.

We use vast quantities of water each day—for drinking, bathing, cooking, and cleaning. We also use enormous quantities of water in industry and agriculture. In industry, water is used in chemical processes and for cooling purposes. In agriculture, water is used for irrigation, cleaning, and food processing.

In Connecticut, we are fortunate to have sufficient amounts of water. Connecticut has many lakes and rivers, and has a good underground water supply. A good water supply is necessary for crops—whether the crop is a field of corn or a meadow full of hay.

If there is too little water, the land becomes cracked and dry. If there is too much water, precious topsoil can be washed away.

Rainfall is a key factor in maintaining and replenishing Connecticut's water supply. Connecticut receives about 45 inches of rainfall every year. We are able to grow fruits, vegetables, tobacco, nursery plants, and other crops that would not grow as well with less rainfall.

Rain is part of the process of recycling our existing water supplies. Water has been purified and recycled —through the Earth's water cycle—since the world began.

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Rainfall and Crop Growth

Vocabulary
rainfall, precipitation, rain gauge

Materials
4-inch diameter tin can or wide-mouth glass jar
Three or four long nails
12-inch ruler
Graph paper

Procedure
Students will create a simple rain gauge. They will place a tin can or glass jar in a convenient location on top of a fence post, or a post installed for this purpose.

The teacher or students will drive three or four long nails into the top of the post surrounding the can or jar. The nails must stick up enough to support the container and prevent it from being blown away by wind.

After each rainfall, students will measure the amount of rain and record it in inches and fractions of an inch. At the end of each month, students will total the number of inches of rain that fell. Students will graph the data.

Students should be reminded to empty the container after each rainfall.

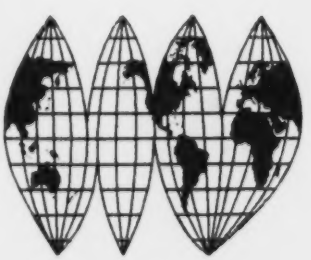
Going Further
Students might research newspapers for the impact of weather on Connecticut farmers. Students will find the answers to the following questions:

What effect does a prolonged rainy spell have on crops?

What effect does a period of drought have on crop production?

What does an unexpected frost do to crops?

Notes:



III. Sowing and Reaping:

Introduction

Farmers must constantly guard against erosion of soil by wind and water. They also must be aware that certain crops drain the soil of nutrients more rapidly than others.

Objectives

Students will:

- Understand patterns of tillage and how the use of farm machinery, fertilizers, and pesticides affect farm production
- Identify harmful and helpful insects, animals, and weeds that affect crops

Background

Before farmers can plant their crops, the soil must be properly prepared to create the best environment for sprouting and growth.

Some farmers loosen the soil surface to allow air to penetrate and to disturb weeds. This process is known as tilling. Two methods of tilling are plowing and harrowing. Plowing and harrowing both loosen the soil surface, but in different ways.

Plowing breaks up and turns over the soil with a farm implement. In Connecticut's rocky soils, plowing raises many stones to the surface, which must then be picked off. This is why some farmers prefer harrowing. The harrow's disks chop the surface, smooth it for planting, and bring up fewer stones.

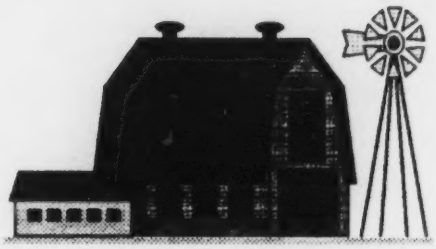
A disadvantage of plowing and harrowing is that they can contribute to soil erosion. To prevent this, some farmers use the minimum-till method of preparing the soil for planting.

The no-till method does not disturb the soil surface, except for the slit into which the seed is planted. Dead weeds or plant stubble remain on the surface and prevent erosion. The decaying thatch helps to enrich and cool the soil.

After an annual crop is harvested, a temporary cover crop, like winter rye, is planted to provide protection against erosion, and is plowed under before the next year's planting.

Food for Thought: 7

Farming Methods



Another soil-conservation technique is contour planting. In contour planting, the farmer plants rows to follow the contours of a hill, thus creating a series of little dams that slow water down. The water then will soak in, rather than erode the soil.

Contour planting may be combined with strip cropping—alternating rows of a crop like corn with a cover crop like hay. This type of cropping is used on sloping land.

Any practice that conserves and preserves the soil is considered by the modern conservation farmer. In addition to being concerned about erosion, the farmer wants to make sure the soil stays nutrient-rich for growing.

The supply of plant food nutrients in the soil is not inexhaustible. Like a bank account, it becomes depleted if the amount withdrawn is greater than the amount deposited. With the growth of each crop, the soil surrenders some of its fertility.

Plants need food just as we do. They must get 15 or more kinds of food or elements from the surrounding air, water, and soil. Nitrogen, Phosphorus, and potassium—and to a lesser extent calcium and magnesium—are needed by plants, and they are needed in large quantities. Most of these elements come from the soil. As the plants grow, they remove these elements from the soil and make them part of the plant itself.

A good way to add nutrients to the soil is by adding fertilizers, either natural or chemical. Animal wastes provide excellent natural fertilizer.

A great deal of animal waste is generated on a farm. For each 1,000 pounds of animal, sheep produce 7.5 tons of manure; beef, 11.5 tons; horses, 8.5 tons; dairy cows, 15 tons; and hogs, 18 tons per year.

Manure is an important natural fertilizer for livestock farmers to use in raising crops. It provides nutrients and organic matter that improve soil composition.

Manure can be piled for storage or kept in specifically designed lagoons until it is time to spread it on the fields. On a few farms, manure is used in special highly technical methane digesters, in which the methane released by the decomposing manure is captured for use as fuel.

Other animal by-products that can be used for fertilizers are ground bones and dried blood. For centuries on small farms, these materials were mixed into the soil to replace the nutrients used by the past year's crop.

Such materials often are not available or sufficient for today's large, single-crop farms. This is why the chemical industry developed fertilizers that can be manufactured in large quantities and easily transported. The availability of commercial fertilizers has helped to increase crop yields and open new lands for farming. These fertilizers are especially helpful to the farmer who doesn't have animals.

A major advantage to chemical fertilizers is the exact formulation of ingredients. Proportions can be made to suit the needs of the soil and crop. The nutrient value of equivalent animal and chemical fertilizers is the same. However, it takes large quantities of energy to manufacture chemical fertilizers, and this adds to their expense.

Overuse, improper use, and careless use of any type of fertilizer can cause pollution and health hazards. Nutrients can wash off fields and into streams and ponds. They can leach through soils and into ground water. Fertilizers, whether chemically manufactured or from plant and animal sources, are important in maintaining soil productivity.

Sowing and Reaping: Farming Methods

In addition to using fertilizers, the farmer also uses natural, chemical, and biological means to control weeds, insects, and other pests. For centuries, tools for fighting off such pests were primitive.

Weeds rob crops of nutrients and moisture, reducing yields. Every few years, a farmer may alternate annual crops, such as corn, with perennial crops such as hay. This practice, called rotation farming, breaks the cycle of noxious weeds or insects adapted to specific cropping patterns.

Some of the harmful insects found in Connecticut are the Colorado potato beetle, leafhopper, aphid, and gypsy moth. Predatory insects can be helpful in controlling pests. The ladybird beetle, praying mantis and ichneumon wasp are examples.

During the 1940's, extremely poisonous chemical pesticides were created. DDT was the first of these highly effective weapons for eliminating pests. Time and research, however, have shown these chemicals to be two-edged swords with serious side effects. They kill many beneficial insects and other life forms as well as the targeted pests.

Insects quickly build up resistance to the poisons. The very long-lasting chemicals built up in the food chains and had devastating effects on some bird, fish, and mammal species. Some of the chemicals got into the surface water and ground water. Since the early 1960's, major changes have occurred in pesticide use and regulations.

Today's farmers use a combination of biological controls geared to specific pest targets, new short-lived chemicals that degrade into harmless products, and crop management procedures to fight insect and plant pests. Plant breeders are developing crop varieties that are resistant to insects, diseases, and viruses. Scientists, government officials, and farmers are working together to produce the safe, abundant, and affordable food Americans enjoy.

Sowing and Reaping: Farming Methods

Vocabulary

tillage, fertilizer, plowing, harrowing, nutrients, pesticides, recycling, strip cropping, contour plowing, cover crop

Materials

Notebooks
Tape recorder

Procedure

The teacher and students will plan a visit to a local farm. If this is not possible, they may invite a farmer, a soil conservation specialist, or a representative of the University of Connecticut Cooperative Extension System to visit the classroom.

Prior to the visit, students will form groups and investigate various methods of Connecticut farming, including plowing, no-till and minimum-till farming, fertilizing with commercial fertilizers or animal fertilizers, crop rotation, erosion-combating techniques, and pest control.

Students will prepare questions to ask the farmer and will take notes and tape record the interview.

Students might ask:

Do you rotate your fields?
Do you use natural as well as chemical fertilizers?
What do you use to enrich the soil?
What kinds of pesticide do you use?
What animals and insects are most damaging to your crops?
How do you control weeds?
Do you plant a cover crop?

With information gathered from the visit, students will create a classroom newspaper about the farming practices used by Connecticut farmers.

Going Further

Students might investigate the effects of erosion on the land. When topsoil is lost because of rain or wind, erosion occurs. Students might recreate the condition in which erosion occurs by following these steps.

Students will:

1.) Choose two sites, different in slope and drainage characteristics.

2.) Stake off an area at each site about one foot by two feet.

3.) Dig up or trample each site to simulate the effect that a bulldozer, logging operation, or pedestrian traffic might have on the land.

4.) Secure a piece of plastic at the lower end of each of the sites.

5.) Pour water from a jug at the upper end of each site to simulate rain. Experiment with the amount and intensity of the simulated rainfall.

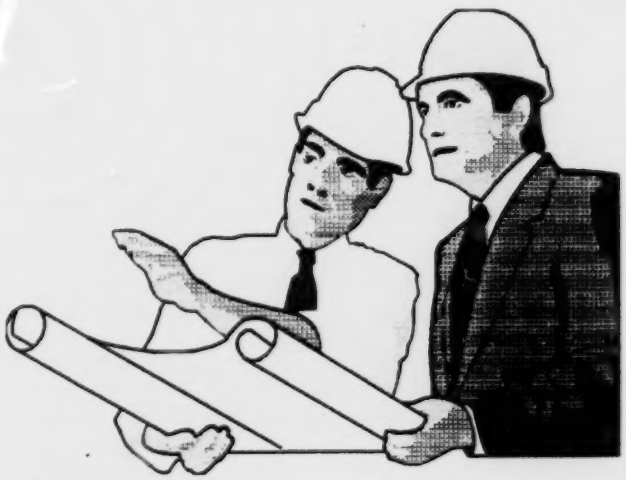
6.) Observe how erosion occurs. The soil will be caught in the plastic at the lower end of each site. It can be observed and measured.

7.) Experiment with covering the soil with rocks, grass, leaves, and twigs to see if the erosion can be controlled. Reapply the water to simulate rainfall.

8.) Compare the amount of soil caught in the plastic with the amount trapped the first time.

9.) Create wind erosion by using cardboard to fan the soil.

Notes:



IV. Breaking the Barrier:

Introduction

No two humans or animals are exactly alike. They show differences in hair or eye color or in the shape of the nose and ears. Similarly, plants have distinguishing traits. They show differences in the seed, roots, stems, leaves, fruit, size, form, and life span.

Every type of plant has its life cycle. The seed sprouts, the new plant matures and produces flowers. After fertilization, a seed is formed, completing the life cycle.

Objectives

Students will:

- Recognize the differences in roots, leaves and stems
- Understand that stems, leaves and root systems vary from plant to plant
- Learn the characteristics of plants through scientific observation and experimentation

Background

Moisture, oxygen and warmth are essential for the process of germination—the sprouting of a seed.

Different types of seeds require varying levels of moisture, oxygen, and warmth. The seeds of a tropical plant may sprout in a few days in the presence of heat and water. Other seeds remain dormant in the soil for months before they germinate.

Some seeds will not germinate unless the dense protective coat that surrounds them is broken. Others require a period of cold temperature before germination takes place.

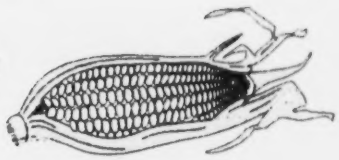
When seeds are dormant, they lose water to the air and become dehydrated. Once germination begins, they require great amounts of water from the soil to sustain their growth. The water allows the seed to convert its stored energy into food for the sprouting plant.

Once germination is complete, the plant will have leaves and roots to gather the water and minerals needed to sustain its life.

The leaves of a plant are able to turn carbon dioxide from the air into sugars. The plant turns these sugars into starches and stores them in its roots.

Some plants store more starches in their roots than others. These plants have become our major root crops. Some of these root crops are: turnips, parsnips, radishes, carrots, beets, onions and potatoes. They are particularly useful because they keep better without preservatives than most vegetables.

How Seeds Come Through the Soil



Vocabulary

seed, root, taproot, stem, leaf, germination

Materials

Large glass jar
Wet paper towels
Two corn seeds
Two pea seeds
Two bean seeds
Notebook or journal

Procedure

Students will line the sides and bottom of a glass jar with a wet paper towel.

The first towel is held firmly against the side of the glass jar and the center of the jar is stuffed with wet towels. Students should make sure all the towels are wet and that there is a small amount of water on the bottom of the jar.

Two bean seeds, two corn seeds and two garden pea seeds then are slipped between the glass and the towel lining it.

In the notebook, students will record:

-The date when the seeds were inserted in the jar
-The date when the seeds germinated
-The date when leaves first appeared

Students will identify and note differences in the way the plants germinate and grow.

Students also will observe and record differences in roots, leaves and stems. They might take photographs or draw sketches to include in the planting notebook.

Going Further

Students might dig up several small plants, examine their roots and sketch the types of root systems found. Students might research these different types of root systems and determine the advantages of each root system to the plant. They might research types of root plants which are food products or are used for medicines and other purposes.

Notes:

V. Where in the World Connecticut Fits:

Introduction

A study of agriculture is meaningless without a knowledge of Connecticut geography and the geography of the United States. It is helpful for students to know the location of Connecticut relative to the rest of the U.S. and to the world.

It is also helpful for students to know that, as a business, agriculture is market oriented. Agricultural exports have a positive influence on the nation's balance of trade. Demand for fresh, year-round supplies of produce have brought about changes in the way we produce and distribute food.

These activities will introduce students to the study of maps. Students will be asked to locate specific information on the maps and will be led to a greater understanding of the effect of geography on Connecticut's agriculture.

Objectives

Students will:

- Locate Connecticut on a map of the U.S.
- Identify local, regional, and worldwide farming regions
- Understand the effects of climate and geographic location on farming

Background

Geography is the study of the earth and its features. The study of geography also takes into consideration the distribution of life on Earth —including human life—and studies the effects of human activity on a region.

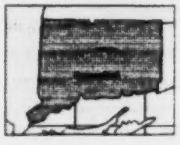
Connecticut's agricultural production is influenced by geography. Our geographic location influences the type of soil, the climate and the length of the growing season for our crops. These factors, in turn, dictate the types of crops that can be raised. Geography also plays a role in how much food a region will need to import, and how much food can be exported.

Connecticut's agriculture is also influenced by how we use our available land. Human activity has caused many changes. Industry has replaced agriculture in many areas of the state. Homes have been built on land that once was farmland. Three million people occupy three million acres.

It is becoming more and more difficult for farms to operate. Increased regulation of land use, environmental protection and the limitations of Connecticut's climate and geographic location are increasing the costs of doing business.

As agriculture becomes more difficult and farms disappear, Connecticut will have to import more food and will have less food to export. At this time, Connecticut does not and cannot produce all of the food its people consume. However, 65 percent of the milk, 100 percent of eggs, and most seasonal fruits and vegetables are produced in the state.

It becomes critical for us to protect the precious farmland we have left. An understanding of geography can help us understand and predict how physical and human processes will affect the farm in the future.



Geography and Agriculture

Vocabulary
import, export, trade, trade deficit

Materials
Atlas
Encyclopedia
World Almanac

Procedure
After studying maps and determining local, state, and national food production patterns, students will brainstorm why world trade becomes necessary.

Students will research the effects of geography on precipitation, soil and food production.

Students will define the terms *import, export, trade* and *trade deficit.*

They also will investigate which crops need the most or least water to grow well and find areas in the world that are similar to the Connecticut area. Students will determine whether the same crops are grown in areas of the world with climates and soils similar to Connecticut's.

Going Further
The concept of trade might be reinforced with a "Product Swap Day." Students pick a region to study. They create facsimiles of their countries' products. Other students do not know what these products are until "Swap Day." Students then display their products, tell where and how they are produced, and offer them for swap. Students will bid on the items and offer trades.

Using an enlarged map of Connecticut for an outline, students can create a crop distribution map for the bulletin board. Symbols of the crops can be designed, reproduced, cut out and pasted on the map to make a colorful display.

Samples of Connecticut crops might be put in plastic bags. The bags can be hung on the bulletin board with a map outline of the state. Using colorful pieces of yarn, the crop can be connected with the area on the map associated with its cultivation.

A World Food Day might be designated. Foods that are grown in different parts of the world can be prepared and booths set up for each region. Other students might sample the foods.

A bulletin board similar to the state bulletin board might be constructed, using a world map and samples of food from around the world.

Notes:

VI. Land Use or Abuse:

Introduction

Connecticut is rapidly losing farmland and other open space to development. Once open space is developed, it is rarely recovered. Valuable animal habitats are destroyed, watersheds are affected, and air quality is threatened.

People are concerned about the impact runaway development will have on Connecticut's future. While recognizing that progress and development are inevitable, citizens groups and government officials are working to encourage sensible development that will have the least damaging effect on the environment. This requires employing well-thought-out plans for land use.

Objectives

Students will:

- Balance the needs of humans, animals and plant life in a given community
- Maximize the value of open space and wise land use
- Plan a community that will consider these factors

Background

As the number of Americans increases, more food and land for housing will be needed. The flattest lands—the lands that are most suitable to build houses, roads, factories, and other structures—also often contain the richest soils. This creates a problem for the farmer.

As the cities and suburbs spread out, the value of land near them rises, which often causes an increase in taxes on the land. The farmer's real profit may be too low to meet these rising taxes. It often becomes necessary to sell the farmland, which may be bought by developers and then built upon. In some cases, a farmer may have been able to get by, year after year, but not have enough income to save for retirement. The farmer then has to sell the land to get money for retirement.

The end result is greater pressure to produce more food on less land, or to open marginal lands to farming. Thus, as years go by, increasing strains are placed on the land that must support more and more of us.

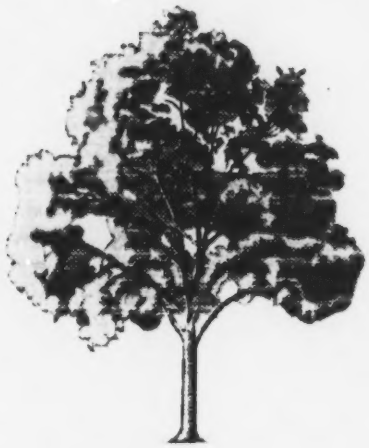
An important value of farms in Connecticut is the open space and landscape beauty they add to this largely urbanized state.

Behind the buildings and beyond the fields, almost every farm has a hedgerow, a brushy pasture, a woodlot, or a pond where nature goes about its business undisturbed.

In Connecticut, most of the privately-owned undeveloped land is part of a farm. A farm field can provide different habitats—areas with living conditions suited for a given community of plants and animals. Within these communities, each species interacts with others of its kind, with other species and with the nonliving environment in a predictable way.

Food for Thought: 17

The Ecology of the Farm



Forest is the natural plant cover of the Connecticut landscape. Abandoned fields will be invaded by wild-flowers and weeds and early successional tree seedlings.

As the seedlings get bigger, the old field gets brushy —woodchucks and bobolinks no longer find this field a suitable home, but fox and rabbits increase in the area. The growing trees eventually will shade out the field plants and create new forest habitats.

Wildlife is part of a farm. A well-balanced wildlife population generally will stay under control. Rabbits and mice will be eaten by foxes, coyotes and hawks. Raccoons will eat insects and small fruits and deer will feed on shoots and grasses.

Some wildlife, while part of the farm, detracts from its success. Woodchucks will raid vegetable crops, and their burrows can harm livestock and damage equipment, causing injury and necessitating expensive repairs. Raccoons can wreak havoc in a cornfield. Birds can destroy or damage a field of ripening strawberries or pull up newly germinated plants. An overpopulation of deer will destroy orchards, prevent woodlots from regenerating and eat young Christmas trees.

It is difficult to find a balance between living with wildlife and making a living. It is also difficult to find the balance among the needs of wildlife, the needs of the farmer and the land needs of a growing population.

Urban Americans will need to become increasingly aware of their dependence upon the land and undertake the land-use planning, population policies, and other actions that will guarantee that the land can continue to provide a quality life for all of us.

Vocabulary

open space, ecology, habitat, zoning, waste disposal, recreational land, planned community, successional

Materials

Graph paper
Ballot box and ballots

Procedures

Students will discuss with the teacher how development affects food production, the availability of open space, and the quality of our lives.

The teacher then will present a scenario. He or she will name an area of open space in Connecticut where a new town, Connectiville, will be developed. A general geographic area of Connecticut will be cited for this new town.

Dimensions of the new town will be 100 by 150 acres. Students will each create a scale model of the parameters on graph paper. The popuation will be 300 men, women and children.

Students must solve the problem of creating a well-planned community, taking into consideration:

- Water supply
- Existing plant and animal life
- Open space
- Recreational facilities
- Waste disposal
- Food production
- Housing—for low, middle and high income people

Students will form a zoning board to discuss issues of concern.

Other students will role-play citizens. They will write leters to the newspaper editor and to legislators. They will make speeches and debate issues affecting their new community.

Local legislators and zoning board officials will be invited in to discuss land use. They will be presented with the scenario for the fictional town and asked their opinion.

On the basis of discussion, research, and role-playing activities, students will complete their graphing activity, creating their finished plans for the community.

Students will present their plans to the class and the class will discuss and debate the pros and cons of each plan.

Going Further

Students are presented with another scenario, this time involving land use. The students must consider environmental issues and weigh them against the needs of a growing population and a technological society.

Teachers will present this scenario: John Porter was a farmer who spent all of his 61 years on Hedge Grove Farm. He had planned to turn the farm over to his only son. He wanted to keep the land in the family. But his son didn't want to stay on the farm. He preferred to work in the city as an investment banker. The farm was becoming too much for John to keep up. But without farming, he had no income and very little savings. He was land rich but dollar poor. John had several requests to sell a valuable parcel of his land: 75 acres located at the river's edge. Potential buyers offered him enough money for the land to provide for a comfortable retirement.

The five potential buyers and their plans are:

#1: To build waterfront condominiums
#2: To build a golf course
#3: To build a shopping center
#4: To build a trash-to-energy plant
#5: To use the farm for a chicken farm

Students will be appointed as town planners and will divide into five committees to investigate the five possible land uses. Each group will be given one week to develop a list of several points, pro and con, to present to the rest of the class. For example, the condominium group might present the following points in favor of the plan:

It will supply needed housing.
Non-industrial use of the land will have less impact on the environment than industrial use.
The setting will be aesthetical pleasing.

Arguments against the condominium development might include:

Private ownership of the waterfront will exclude the public from enjoying the land.
There may not be adequate sewage facilities to support a large complex.
The area's ecology may be adversely impacted.

The golf course group might balance the positive feature of open space against the heavy use of pesticides and fertilizers, which could affect the water supply.

The trash-to-energy group might investigate the need for trash disposal and compare it to the impact a plant would have on the air, soil and water.

The chicken farm group might investigate the problem of manure disposal in Connecticut and weigh it against the farm's food-producing potential.

Teachers will ask the students in each group to report their findings. The class will discuss all the findings and vote on their recommendations to Mr. Porter.

Change and Continuity

In the early days of this country, almost everyone grew up on a farm. Farms were small and crops were harvested with simple tools. Families grew their own food and sold animals and crops at local markets.

Today, there are fewer family farms. Farmers have become so efficient that fewer of them are needed to produce food for those of us who live in towns and cities. Today's farmers use improved methods of crop rotation, fertilization and irrigation. They work with more productive and disease-resistant breeds of plants and animals developed by scientists.

The farm does not need as many workers because machines are able to do the work faster. The children who stay to work on the farm, as well as those interested in an agricultural career, may attend agricultural schools to learn skills and new technologies.

Farming is a complex business today. Even when you grow up on a farm there are many skills you need to learn before you can manage your land and livestock properly.

There have been many changes on the farms since the days of the settlers. However, on the old family farms, one can find clues to the history of this country. The story of farm life is a large part of the history of this country, and is still a part of our present.

I. A Farmer's Journal:

Introduction

In 1790, about 90 percent of all working Americans were farmers. Farming and farm life pervaded American culture.

Today, particularly in Connecticut, the average citizen knows very little about farm life. In this activity, students will examine the everyday existence of the colonial farmer and the modern farmer.

Objectives

Students will:

- Research the life of early and modern farmers
- Create a "Day in the Life" journal
- Compare early farm life with modern farm life

Background

Connecticut was known as the "Provision State" during the Revolutionary War because it was instrumental in providing food for the colonial army. Colonial farmers accomplished this without the technology that allows for great productivity today.

Early farmers used a tool that looked like a gigantic, heavy rolling pin pulled by oxen. They rolled this log over their fields to pack down the surface of new meadows, cover broadcasted seeds and crush clods of earth.

There were no chemical fertilizers. Manure was precious because it was a good fertilizer. In the winter, farmers put manure in big piles so it would not freeze. In the summer, they watered the manure pile when it became too dry. They turned the manure pile with a fork when it smoked from the heat.

Food could not be transported long distances because of the possibility of spoilage and the lack of fast transportation.

The first farm wagons had wooden axles reinforced with a strip of iron. These wheels creaked and soon became stiff. Farmers carried grease for the wagon wheels when they went on long trips.

As the Industrial Revolution reached Connecticut, roads were improved and communities were linked together. Farmers began to specialize and produce a surplus for the small village populations.

Toward the end of the 1800's, improved railroads brought in competitive products from the West and South. Connecticut agriculture turned towad beef, dairy products and other perishables to feed its city populations.

A Day in the Life of a Colonial Farmer

Today Connecticut produces 100% of the eggs its residents consume, as well as 65% of the milk and most of the vegetables in season.

The trend toward diversification, specialization and an intense new interest in marketing has been, and will continue to be, a help to Connecticut farmers.

Modeled after the hard work of our forefathers, agriculture in Connecticut is more productive than ever.

Vocabulary

subsistence, specialize, surplus, perishables, diversification, specialization

Materials

Student journals

Procedures

Students will research colonial farm life, including economics, entertainment, politics and education.

They will gather enough material to create a journal entry entitled "A Day in the Life of an Early American Farmer."

Students may choose to write their journals from the perspective of the farmer or the farmer's wife or perhaps through the eyes of a farm child their own age. The farmer and his family may, for example, have just returned from an excursion to a country fair, where Bess, their cow, won first prize. At the fair, they might have listened to the mayor or selectman deliver a speech about farm prices.

Following the same research process, the students will create a journal entry for "A Day in the Life of a Modern Connecticut Farmer."

This lesson might be summarized in a class discussion on the concept of change and continuity in farm life.

Going Further

The class creates a two-act play from the "Day in the Life" materials. The differences and similarities of the old and the new are stressed by repeating a similar scenario with two different time frames.

Notes:

II. Tools of the Trade:

Introduction

Most farmers will acknowledge that modern farm implements have vastly improved production and farmers' lives. Yet, there is a growing nostalgia for the past and a desire to preserve as much history as possible for future generations.

Museums, such as Old Sturbridge Village and Plimoth Plantation in Massachusetts, and the Bloomfield Farm Implements Museum in Connecticut, are valuable resources for learning about our nation's agricultural history. These museums bring to mind the customs and traditional practices of earlier times—times when life was harder but less complicated.

It is worthwhile to study the contrast between the old and new and to learn what farming methods have changed and what methods have basically remained the same.

Objectives

Students will:
- Research and identify old farm implements
- Discuss the uses for the implements
- Compare them to modern farm tools

Background

Native Americans farmed Connecticut soil long before European settlers came. Since that time, the state's agriculture has gone through many changes.

In the Colonial period, most farms were for subsistence only. As the population grew, more farms—and better ones—emerged.

During the first half of the 19th century, the Industrial Revolution was getting underway in Connecticut. Technology revolutionized the way farmers worked their crops. In 1834, the McCormick reaper was patented, and in 1837, John Deere and Leonard Andrus began manufacturing steel plows. The first light tractor was developed in 1926.

Vocabulary

plow, cultivator, harrow, scythe, dibble, seed drill, barrow, hand tool, implement, clapper, sowing basket, bushel, measure

Materials

Handouts:
Early Farm Implements
Modern Farm Implements

Historical and Modern Farm Implements

Procedure

Students will study the handouts illustrating early and modern farm implements. Each student will select an implement to research.

Students will research questions such as:

What does the implement do?

How was it used in the past?

Is it still used today?

What is the modern equivalent, if there is one?

Which tools were used in Connecticut?

Which are used in Connecticut today?

Students also will be encouraged to bring old farm, garden and barn tools to school for informal "What Is It?" sessions. The student who brings in the tool shows it to the class and asks the other students to guess its name and purpose. The class then brainstorms alternative uses.

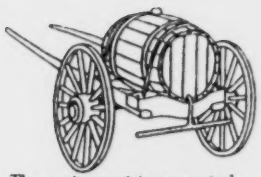
Going Further

The study of tools both past and present might culminate with a trip to both a museum or historical village and a modern working Connecticut farm. During the visit, students will be encouraged to take a tool tally, naming and numbering the tools they recognize.

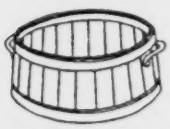
For more information on farm implements, contact:
Bloomfield Farm Implement Museum
Connecticut State Library Archives

Notes:

Early Farm Implements

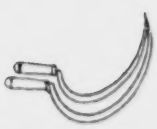


The **water cart** transported water for drinking or for moistening the land.

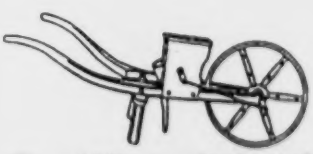


The **bushel measure** was used in most farm transactions. It was a measure of capacity, containing four pecks or eight gallons.

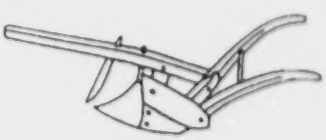
The **sowing basket** was strapped on the farmer and seeds would be tossed manually.



A **sickle** is an implement with a curved blade or hook with a handle, for use in cutting grain or grass.



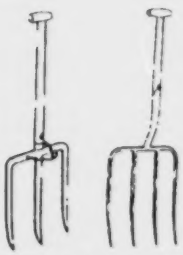
The **seed drill** was used to plant seeds once the soil was properly prepared for sowing.



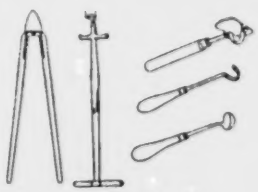
Plows cut furrows in the soil to prepare it for sowing or planting.

The **sack barrow** carried sacks of potatoes or grain.

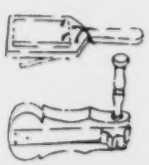
The **cultivator or harrow** was used to clean and stir the soil, bringing up weeds, roots, or large stones that were buried beneath the surface.



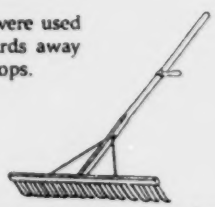
Forks helped the farmer move and harvest his vegetables. They were designed to gather or harvest vegetables or potatoes without damaging them.



Dibbers are pointed instruments used to make holes for planting seeds or bulbs.



Clappers were used to scare birds away from the crops.

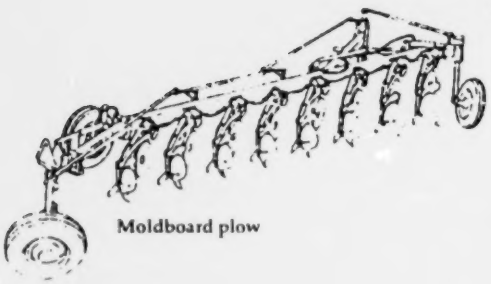


Rakes have tines for gathering farm stubble after harvesting or for smoothing the surface of the ground.

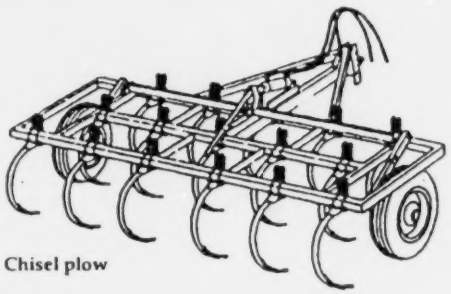
From "Farm Tools" by Michael Partridge, Promontory Press

Modern Farm Implements

A farm tractor is used to pull these implements.

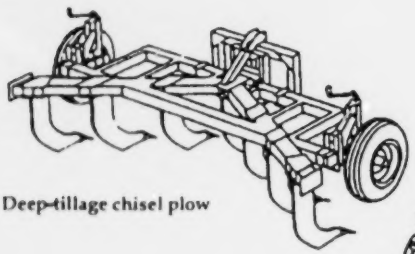


Moldboard plow

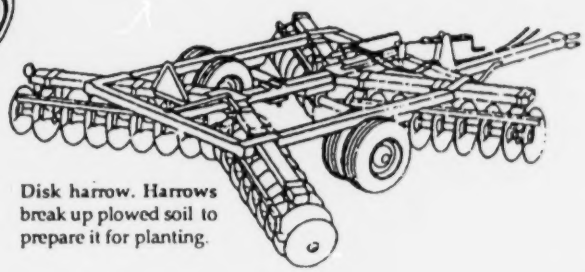


Chisel plow

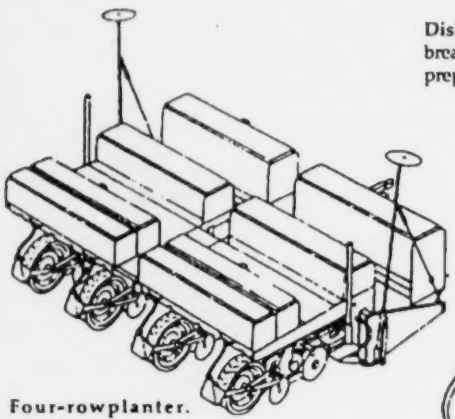
Plows are used for primary tillage—the original turning over of the soil each year.



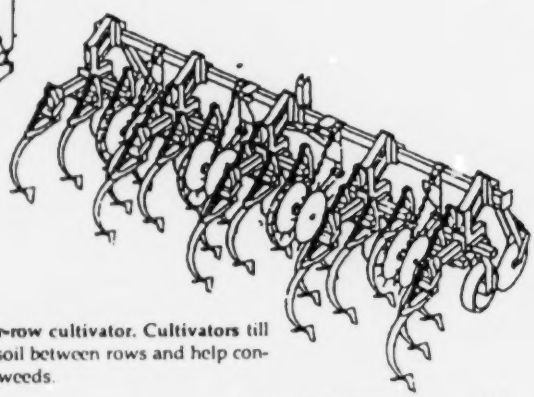
Deep-tillage chisel plow



Disk harrow. Harrows break up plowed soil to prepare it for planting.



Four-row planter. Planters plant seeds in rows.



Four-row cultivator. Cultivators till the soil between rows and help control weeds.

World Book illustrations by Robert Keys

III. Conflicts on the Urban Fringe:

Introduction

In this lesson, students are presented with the topic of farming on the urban fringe. Students will explore several issues that deal with the encroachment of suburbia into rural Connecticut and the conflicts that sometimes develop between new homeowners and farmers.

Objectives

Students will:

- Become aware of Connecticut's Right to Farm Law
- Learn about problems farmers may have with new neighbors
- Become aware of land use planning tools to help resolve the urban/rural land use conflict
- Recognize that urban people often do not understand what is involved in the daily operation of a farm

Background

In the 1700's, much of the eastern part of our country was heavily forested. The early settlers cut the trees and tilled the soil to create farms that were to feed a new nation.

During Colonial times, almost everyone in Connecticut lived on a farm. Even merchants and tradesmen had a family garden, a cow and some chickens. At first, most of the farms provided mainly for the families that farmed them. During the 1800's, many changes started taking place. Inventions led to greater farm productivity. In time, farms were enlarged and more livestock and crops were raised for sale to nearby cities and towns. Some of the crops were even exported.

Fewer workers were needed on the farms. Many of the displaced farmers moved to the cities to work in new factories that were springing up along Connecticut's rivers.

Yet, even though people were moving to live and work in the new mill towns, they had relatives who lived and worked the farms. Agriculture was still an important part of everyone's life in Connecticut. By the mid-1800's, much of the forest land in the East had been cleared and the human population was growing rapidly. In the Northeast, some of the farms were abandoned as people moved into cities.

Continued increases in farm productivity in the late 1800's, coupled with the invention of refrigeration and new food processing techniques, rapidly changed the way Connecticut's citizens viewed their food supply. As time passed, grocery stores

The City Mouse Meets the Country Mouse

and supermarkets replaced farmers' markets. Processed foods stocked shelves and fewer people had relatives who lived on the farm. Today, many people do not know where their food comes from. They do not associate the food they eat with the farmer down the street.

Suburbia has expanded into traditionally agricultural areas. At first glance, residential neighborhoods and agriculture might be viewed as compatible land users. Unfortunately, this often is not the case, and conflicts can arise between neighbors.

Many people who move into new homes near farms know little about agriculture. They do not understand the daily activities that take place as part of a normal farming operation. Farmers work long hours to ensure that their farm is productive. Livestock needs to be fed and stalls cleaned daily. Fields need to be planted, fertilized, cultivated and harvested according to the season. Maintenance of buildings and machinery is ongoing.

Weather conditions require farmers to be flexible with their schedules. For example, the corn a farmer may have wanted to plant on Wednesday may not get planted until Saturday or Sunday because of rain. A strawberry farmer may need to turn on his irrigation system at night to protect his crops from frost. Dairy cows need to be milked every day, including weekends. Many dairies milk their cows at night as well as during the day.

Residential land users often complain about the farmers' long work hours and the accompanying noise. They also complain about smells from livestock and airborne agricultural substances such as lime, fertilizer and pesticides. However, these are all part of a normal farming operation.

Besides dealing with nuisance complaints from neighbors, farmers have other problems associated with residential land use. Farmers often are faced with theft of produce from fields, crop destruction by off-road vehicles, vandalism of crops and buildings, harassment of livestock and liability of trespassers. Many people do not realize that the farmer's land is private property and not a public park.

In 1981, the Connecticut General Assembly passed Public Act 81-226. This is often referred to as the Right to Farm Law. Basically, it protects existing farmers from nuisance complaints as long as the farmer follows generally accepted agricultural practices.

Conflicts on the Urban Fringe: The City Mouse Meets the Country Mouse

Proper land-use planning can prevent conflicts between farmers and their neighbors. One technique is to provide a buffer zone between farms and houses. Another technique is to provide a forum for understanding and for an educational exchange between farmers and their neighbors.

Vocabulary

vandalism, nuisance complaints, urban, rural, suburbs, land-use conflicts, buffer zones, Right to Farm Law

Materials

Handout on page 18
Conflicts on the Urban Fringe: Land Use Scenarios

Procedure

Students are divided into three groups.

Each group will have one of the scenarios to work on. Students will read their scenarios and discuss them with the group.

They then will present their scenario to the rest of the class, addressing both the pros and cons of the situation.

The class will vote on the issue to be decided. The students will discuss why they voted the way they did.

Going Further

Students may watch for stories in the local newspaper about urban/rural land-use conflicts.

Students may contact their Farm Bureau office to see what types of legislation the farmers are trying to pass to protect their right to farm.

Notes

Conflicts on the Urban Fringe: Land-Use Scenarios

Scenario 1

Countrydale, a new 42-unit condominium complex, was built on the old Simmons farm in the town of Farmdale. Bordering Countrydale is the 400-acre dairy and corn silage farm operated by Harry Smith. Harry's family has owned the farm for more than 150 years. Harry is well-respected in the farm industry. He was recently recognized by the Soil and Water Conservation District for using sound environmental practices on his farm.

The condominium dwellers chose Countrydale as a place to live because they liked the open space. They wanted to ride their bicycles along the country roads and breathe the fresh country air.

After a month at Countrydale, however, the new neighbors decided they were not very happy with life near a farm. Twelve of the new neighbors signed a petition complaining of odors coming from the farm. The petitioners claimed they could not have a picnic because of the smells. They also complained that Harry's tractor got in the way of traffic and made too much noise on Saturday and Sunday mornings. The petition was sent to the town manager, who called a public meeting to hear both sides of the issue. A compromise is sought.

Scenario 2

Tom Jameson is upset because his 12-acre cornfield was ripped up by an off-road vehicle (ORV). Mary Adams had to destroy a sheep that had broken its leg while being chased by two boys on dirt bikes. Tom and Mary decide to organize a meeting of farmers who have experienced similar episodes of ORV vandalism. The farmers decide to propose a bill that restricts ORV use. It is submitted to the state legislative committee.

The legislative committee holds a hearing on the proposed bill. The farmers try to convince the committee of the need for regulation. The ORV manufacturers and users speak against the new proposal, saying it is an infringement of their rights. The legislative committee must determine whether or not to submit the bill for passage. A decision must be made.

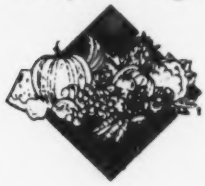
Scenario 3

Cindy Potts owns a 250-acre tree farm. On the farm, there are a number of fire access roads. The roads are well-suited for hiking, horseback riding, and cross-country skiing. Since Cindy is friendly with most of her neighbors, she has given them permission to use her land, provided they do not litter or damage the property.

In January, the Abbott family moves into the area. They assume the right to use the Potts Farm for their recreation, since they see their neighbors using it. Jill Abbott, the Abbotts' daughter, is cross-country skiing one Saturday when she loses control and hits a tree. Jill fractures her arm and loses a front tooth. Her parents go to the town hall to find out who owns the land. They decide to sue the landowner because the accident happened on the landowner's property.

The case goes to trial and the court finds that Cindy is not responsible for the accident because she did not willfully or negligently create a hazard on her property. Cindy had to spend five days in court and $3,000 in attorney fees to win the favorable ruling. She begins to have some doubts about letting people use her land.

When she returns home, she takes a walk and finds that hikers have been littering, and horseback riders have been trampling her tree seedlings. They have not respected her land. She posts a sign that reads "No trespassing. Private property. Violators will be prosecuted." The neighbors are very upset. There is no other place for townspeople to go for outdoor recreation. A neighborhood group is formed, and a compromise is sought.



IV. The Fruits of Farm Labor:

Introduction

One of the most notable changes in farming today is increased productivity. Farming practices have been improved and technological advances have increased yields and reduced labor hours. Today's farmers are better trained than at any time in our history.

Objectives

Students will:

- Compare labor hours needed to produce corn in 1800 to labor hours needed in 1980-1984
- Figure the percentage of increase in crop yield

Background

Crop farming involves preparing the soil, planting, cultivating, harvesting, processing and storing. Modern farm equipment can perform these operations quickly and easily.

By today's standards, colonial farming methods were tedious. The colonial farmer worked mostly with hand tools. Some farmers had homemade wooden plows. They were so heavy that it took four horses or oxen to pull them.

The use of modern farming equipment has vastly changed agriculture and has enabled the American farmer to produce bigger harvests with less labor.

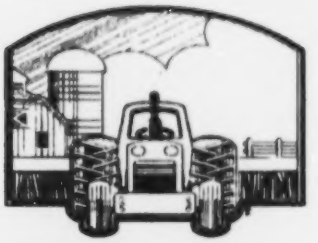
One U.S. farm family feeds 79 people—53 in the U.S. and 26 abroad. At the turn of the century, the farmers struggled to produce 110 bushels of corn on four acres of land. Today, one acre of land yields that much corn.

More than 22 million people throughout the United States count on the farmer for their livelihood. These men and women work at grading, storing, processing, packaging, transporting and selling food.

Today's farmers are often specialists, growing only one kind of crop or raising only one type of animal. In Connecticut, however, farmers are experiencing labor shortages, land pressures and low milk prices. As a result, many farmers are starting to diversify their production. This diversification is aimed at producing high value specialty crops for wealthy urban and suburban consumers.

Food for Thought: 32

Farm Productivity



The family farm of the 1990's may be using hydroponic techniques to grow vegetables in the city or tissue culture to start ornamental plants in the laboratory. Computers in the barn may regulate the grain fed to cows in a fully-automated milking parlor. All family members may be involved in an aquaculture operation —raising oysters, tending to equipment or marketing and transporting the finished product.

Much has changed in the ways people farm, but the basic values of hard work, commitment and care of the land remain as important to successful farming as they were in the 1700's.

Vocabulary

census, yield per acre, production

Materials

Handout
A Recollection

Procedure

The students and teacher will review the statistics on the Recollection handout. The teacher will ask the students to locate specific information on the charts.

For example, the teacher might ask the following:

How many hours of labor did it take in 1955-59 to produce 100 bushels of wheat? In 1980-84?
How many bushels of wheat per acre did the 1800's farmer produce? The 1985 farmer?

Once the students are comfortable reading the chart, a number of math activities can be presented. Here are some sample math problems the teacher might present:

How many hours have been saved in the production of 100 bushels of wheat between 1800 and 1985?
What is the percentage of increase in cotton crop yield between 1800 and 1985?
If a farmer worked about 10 hours a day, how many weeks would it take to produce one bale of cotton in 1800? In 1935-39? In 1955-59? In 1980-84?
Which product had the highest yield of bushels per acre in 1800? In 1985?

Going Further

Students might research and compare the yield per acre of major Connecticut crops.

Notes

A Recollection

The 1790 census showed that about 90 percent of all Americans in the labor force were farmers.

Total income from agriculture was $266 million in 1800 (the first year for which figures are available). This was 39.3 percent of the national income. At that time, each farm worker grew enough food for about four other people.

The invention of the cotton gin in 1793 caused a sharp rise in production. Production for other crops in 1800 was 160 million bushels of grain products, 22 million bushels of wheat, 107 million pounds of tobacco and 300 million board feet of lumber.

The following table shows how labor requirements have changed since 1800.

Labor required to produce wheat, corn and cotton, in hours				
	1800	**1935-39**	**1955-59**	**1980-84**
Wheat (100 bushels)	373	67	17	7
Corn (100 bushels)	344	108	20	3
Cotton (1 bale)	601	209	74	5

The increase in yields for wheat, corn and cotton is shown below.

Yields per acre in wheat, corn and cotton				
	1800	**1940**	**1960**	**1985**
Wheat (bushels)	15	15	20	34
Corn (bushels)	25	29	55	118
Cotton (pounds)	154	253	446	630

V. Classic Cooking:

Introduction

The first cookbook written in the United States was printed in Hartford in 1796. It reflected the nation's newly won independence— politically and culturally. It was the first cookbook to feature uniquely American recipes.

Apples were a favorite of colonial Connecticut cooks. Apples were abundant and inexpensive, and they could be stored for winter use when other crops were not available.

The following lesson allows students to sample some early American cuisine, while practicing their math skills. They will use apples as the main ingredient.

Objectives

Students will:

- Prepare early American recipes
- Double and halve recipe amounts
- Estimate the quantities needed to prepare recipes

Background

The food our colonial ancestors ate varied by geographical region, by economic class, and by season of the year.

The colonies were hours and even days apart by horseback, and people in different areas ate different kinds of foods. What we think of today as American regional cooking had not yet developed, but certain dishes were typical of various parts of the country.

People in New England, for example, ate more corn than wheat. In the South, the reverse was true. In New England, people ate such foods as hash and Indian pudding.

In the South, where a distinctive cuisine had not yet developed, occupational and class differences were much more marked than elsewhere in the new nation. The rich had elaborate dishes from English cookbooks. By contrast, the poor ate simply prepared and cheaper dishes.

In the far South, the upper classes ate white bread as a matter of class distinction, while the poor and the slaves ate sweet potatoes, peanuts and broken rice, low-quality rice that had been broken in the threshing process. Diets changed with the seasons. Cold weather brought red meat to the table, since unneeded livestock was slaughtered before the winter began, when the meat could be kept in unheated pantries.

Young chickens which had hatched in the spring grew to be young roosters and pullets —and thereby furnished meat for the summer. Old hens became the proverbial "chicken in the pot" when they ceased laying eggs.

Milk and cream were abundant by spring, after cows dropped their calves and grazed on lush pastures. Fresh cream and butter played an important role in English cooking.

Stirring Up the Past

From late spring until the first frost, fresh vegetables were readily available from home gardens and street markets in the towns. After frost, families turned to root vegetables, cabbage, pumpkins and squash.

Peas, beans and lentils were winter staples. Apples would keep in root cellars until late winter; then cooks used dried apples.

Succotash is a direct descendant of a Native American dish of corn and beans called "sukquttahash." Native Americans planted the bean seeds beside the corn and let the bean vines grow up and around the growing stalks of corn.

Along the Atlantic seacoast, fish and shellfish were an important part of the diet —but 20 miles inland, the only fresh fish were those caught in rivers and lakes. In the 18th century, the catch of the day determined the menu, regardless of the region.

Hush puppies, according to legend, were bits of dough fried in deep fat at the same time fish were being fried. They were thrown to the dogs to keep them quiet while the family was eating.

New England seafarers were traders as well as fishermen, whalers and merchants. At every port where ships put in, sailors sampled local foods and took aboard new ideas as well as samples and seeds.

In 18th century America, as in England, pies were commonly served at mealtime. A pie, usually the main dish at a meal, was a crust filled with meat, fowl or shellfish in a sauce or gravy. This was covered by a second crust and baked in a brick oven.

Salad ingredients not only were grown in gardens, they were gathered in the wild as well. Spring onions and such weeds as dandelions and lambs quarters grew wild and were a welcome harbinger of spring and a needed source of vitamins after the winter.

Pastries, when filled with fruit, custard or other sweets, were called tarts. Tarts were usually open-topped but often were decorated with pieces of crust cut into fancy shapes.

Classic Cooking: Stirring Up the Past

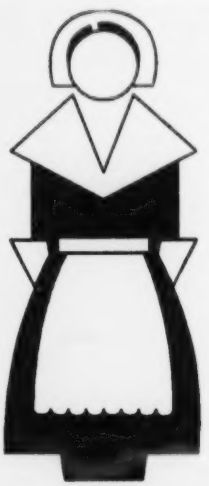
Puddings were a very important part of the cook's repertoire. Puddings served as a repository for scraps and leftovers, stale bread and pan drippings.

Indian pudding was a popular dessert. It included corn meal and sometimes milk or eggs. It was sweetened with molasses and seasoned with cinnamon and cloves, cooked in a pot until thick and then baked until firm.

The most important piece of cooking equipment was the stew pot, which was in continuous use for making porridges, stews and puddings and for heating water.

A well-known dish in Philadelphia taverns at the time was pepperpot, which contained stew meat, cayenne pepper, potatoes, dumplings and tripe, which is the stomach of a cow.

In 1796, the first cookbook to be both written and printed in America was published in Hartford. Authored by Amelia Simmons, it was also the first cookbook to contain recipes using American foods as well as European foods. Her book was very popular and remained in print until the 1830's.



Adapted from "If You Want to Taste American History, Just Try These Bicentennial Ingredients" by Jane Porter, Department Historian, Economic Research Service, USDA News, 1987.

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Food for Thought: 37

Classic Cooking: Stirring Up the Past

Vocabulary

mixture, core, shred, blend, quartered, pastry, flute

Materials

Handout:
Classic American Recipes
Cooking utensils
Ingredients for preparation of selected recipe(s)

Procedure

The lesson can begin with the teacher presenting an overview of the foods and culinary customs of early Americans.

Students will discuss with the teacher the Connecticut recipes on their handouts.

The class will be divided into five groups and will be asked to complete various math tasks using the recipes.

For example, the teacher might ask the students to:

Double the ingredient amounts in their recipes.
Halve the ingredients in their recipes.
Estimate how many apples will be needed to prepare their recipe.

The lesson might end with each group preparing their selected dish and sharing it with the group.

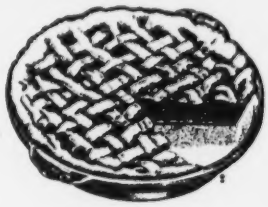
Going Further

Students might compile a classroom cookbook by asking relatives and friends for their favorite recipes. They could include a short paragraph about the family tradition behind each recipe.

Notes

Classic Apple Recipes

Connecticut Apple Pie



Fill your pie dish 3/4 full with sliced and peeled Connecticut apples.
Add:

1 tsp. cinnamon
2 tsp. sugar
1 tsp. nutmeg

Mix the following together:

3/4 cup melted butter
1 cup flour
1 cup sugar
pinch salt

Mixture should be the consistency of tollhouse cookie batter. If you wish, add nuts, coconut or raisins. Pour mixture over the apples. Bake at 350° for 30-40 minutes until golden brown. Serve warm, topped with whipped cream or ice cream.

Granola Baked Apples

4 Connecticut cooking apples
3/4 cup granola cereal
2 Tbs. brown sugar

Core apples and cut out centers, leaving a 1/2-inch shell. Chop 1/2 of the apple center and reserve. Cut a strip of peel 1/2 inch wide around the top of the apple. In medium bowl, mix granola, chopped apple and brown sugar. Fill apples with mixture and place in shallow baking dish; add 1/4 inch water to bottom. Cover and bake 350° oven 45 minutes or until apples are tender. Serve with sour cream, if desired. Makes 4 servings.

Apple-Cabbage Slaw

4 cups shredded green cabbage (about 1/2 a medium cabbage)
1/2 cup mayonnaise
4 1/2 tsp. sugar
4 1/2 tsp. fresh lemon juice
1 Tbs. milk
1 tsp. celery seed
3/4 tsp. salt
1/8 tsp. pepper
2 Connecticut apples, cored and chopped

To prepare cabbage, remove tough outer leaves and discard. Cut into quarters, core and cut into thin shreds with a knife or shred on a coarse grater. In large bowl, blend mayonnaise with next six ingredients. Add cabbage and mix well. Chill several hours. Add apples just before serving. Makes 8 servings.

Classic Apple Recipes

Classic Fresh Apple Pie

2 cups sifted all-purpose flour
1 tsp. salt
2/3 cup plus 2 Tbs. solid vegetable shortening
1/4 cup ice water
1 cup sugar
1 Tbs. cinnamon
1 tsp. sugar
6 cups thinly sliced, pared Connecticut apples

To make crust: In a medium bowl, mix flour and salt. Cut in shortening with a pastry blender or two knives until the particles resemble large peas. Sprinkle with water, a little at a time, mixing lightly with a fork, until all flour is moistened. Make a ball with the dough and place on a lightly floured, cloth-covered surface. Divide in half. Roll one half into a 12-inch circle. Fold pastry and carefully transfer to 9-inch pie plate. Unfold and loosely place in pan, leaving overhang.

For filling: Combine cinnamon, nutmeg and sugar and mix thoroughly with apples. Turn into pastry-lined pan. Trim overhanging edges. Roll out remaining half of dough for top crust, large enough to extend 1 inch beyond edge of pan. Fold and place pastry over pie, then unfold. Fold edge of top pastry under edge of lower pastry on rim. Seal by pressing with fingertips; flute. Make several slits near center to allow steam to escape. Bake in 350° oven for 50 minutes, until pastry is well browned. Makes 8 servings.

Fresh Blender Applesauce

In container of electric blender, place:

4 large Connecticut apples, peeled, cored and quartered
1/2 cup water
3 Tbs. honey
1/8 to 1/4 tsp. cinnamon

Blend at medium speed until smooth, about 1 minute. Serve at room temperature or chill. Makes 3 cups.

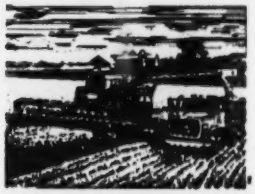
Making a Living

Americans can buy their food for less of their disposable income today than they could even a few years ago because of the farmer's productivity. Modern high-technology equipment and farming practices, agricultural chemicals, farmer know-how and scientific research are responsible for this productivity.

Food expenditures represent 16% of disposable income today, compared with 17% just five years ago and 23% in 1951.

In China, where 60% of disposable income goes to food expenditures, 70% of the Chinese population is involved in agricultural production as compared to 2.1% in the U.S.

Despite recent rises in food prices, a family's income buys considerably more food today than thirty-five years ago, partly because agriculture has become efficient and partly because consumer incomes have risen faster than prices.



I. Get Fresh:

Introduction

Many of us sit down to a meal without thinking about the sources of the fruits, vegetables, meats, shellfish and poultry products we enjoy.

This activity will familiarize students with Connecticut-grown products and help them understand basic facts that influence production and distribution.

Objectives

Students will:
- Identify Connecticut's key crops and products
- Understand how climate affects availability
- Reinforce the skills of categorization, classification and alphabetization

Background

A healthy agriculture keeps the wheels of the economy turning. Food means jobs—for storage, processing, transportation, offices and supermarkets.

Agriculture is America's largest industry. If all of the assets of the to 400 industrial corporations in the United States were combined, this total dollar figure would fall short of what American farmers have invested to produce farm goods.

One U.S. farm family feeds 79 people—53 in the U.S. and 26 abroad. Agricultural production is more than twice the levels of 1930.

At the turn of the 20th century, farmers struggled to produce 110 bushels of corn on four acres of land. Today one acre of land yields that amount of corn.

One massive combine working the Great Plains harvests enough wheat in nine seconds to make 70 loaves of bread.

An American family of four consumes about two and one-half tons of food a year. This includes some 629 pounds of red meat, mostly beef and pork; 260 pounds of chicken and turkey; 1,223 pounds of dairy products; 51 pounds of seafood; 88 dozen eggs; 336 pounds of fresh fruits; 13 pounds of frozen fruits; 400 pounds of fresh vegetables; and 598 pounds of flour and other cereal products.

Vocabulary

availability, crop yields, products

Materials

Handouts:
Connecticut Agricultural Facts
Connecticut Grown Crop Availability Chart
Connecticut Agricultural Products Map
Get Fresh flash cards

Understanding Connecticut Farm Production

Procedure

The teacher prepares one set of Get Fresh flash cards by copying the sheets, mounting them on heavy-weight paper and cutting them into cards. The name of the products is then written on the reverse side of each card.

After the cards are prepared, they may be used in a variety of ways to reinforce various skills. Here are some examples.

Students might:
Arrange cards in alphabetical order

Categorize cards into vegetable, fruit, seafood, dairy, poultry, nursery, livestock and other products

Rank products in order of longest availability during the year

Test each other in pairs by naming facts about each product

Research each product and add one or two facts to each card; include nutritional information and price information

Locate a Connecticut producer of each product. Write the producer's name and address on each card; write to the producer for information

Determine which items are in greatest supply and which are in greatest demand; graph the production of the products

Discuss the costs of production of each product

Determine which products are produced in quantities that meet the needs of Connecticut's population

Search Connecticut newspapers for advertisements selling the products.

Plan a balanced meal using flash cards

Connecticut Agricultural Facts

Although Connecticut is the 5th in size in New England states, it ranks #1 in net farm income per square mile! Connecticut agriculture is dynamic, still evolving and changing from decade to decade and continues to make significant contributions to the life of Connecticut citizens.

There are approximately 3900 farms with 380,000 acres in Connecticut. Our state has a $900,000,000 income from agricultural production with a total impact of 2.1 billion dollars on the state's economy! Aquaculture is a $61,000,000 industry and nursery and greenhouse production represents $128,000,000.

Not only that, but 60% of the land area of Connecticut is in farmland, open space and forests. This is an important natural resource base and it adds to the beauty of our state and makes it a better place to live, work and play. Taxpayers benefit from open space and farmland classification. For example, a study done in the town of Hebron determined that to provide services to residential property it would cost $1.06 versus $.36 for farm, forest or open property.

Connecticut farms are very diverse. In addition to the traditional dairy, poultry and livestock operations, we also have vegetables, fruits, berries, Christmas trees, greenhouse and nursery crops, tobacco, dairy goats, rabbits, llamas, farm-raised pheasants, wineries/vineyards, maple syrup, honeybees, mushrooms, shellfish, forestry and so much more!

Agriculture also employs a tremendous number of people. Last year over 50,000 people were employed in one aspect of agriculture or another. This number includes agricultural production, farm inputs and processing and marketing.

How Connecticut Agriculture Ranks in the United States

OYSTERS: 1ST in value, 2nd in production
EGG LAYING POULTRY: 1st in density
HORSES: 1st in density
MUSHROOMS: 5th in production
PEARS: 8th in production
DAIRY COWS: 9TH in density
MAPLE SYRUP: 10th in production
MILK PRODUCTION per cow: 11th
(highest in 1997 in all states east of Colorado, except Michigan and New Hampshire)

Farmers, Stewards of the Land!

Modern Farm Practices Result in:

- Fewer acres of soil lost to erosion
- Food and habitat for 75% of the nation's wildlife
- Crop protectants used effectively and safely
- Sustained productivity of the land
- Enhanced air quality

Prepared by Connecticut Farm Bureau with information from Dr. W.A. Cowan, Emeritus Professor, Department of Animal Science, University of Connecticut. Statistics obtained from the 1997 reports of the statistical reporting Service of the U.S.D.A. and the Connecticut Department of Agriculture. 9/98

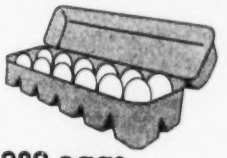
For each resident of our state, Connecticut farmers produce...

288 glasses of milk

1 Christmas tree for every 8 residents

8 pounds of sweet corn

1 pumpkin for every 3 residents

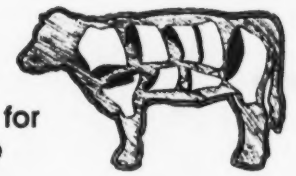


280 eggs

2 quarts of strawberries

and have...

8-12 pounds of apples



1 head of cattle for every 46 people

1 horse for every 65 people

Did you know?....

Connecticut ranks #1 in New England in:

- Aquaculture Production & Value
- Horse Numbers
- Mushroom Production
- Peach & Pear Production
- Tobacco Acreage & Production
- Density of Egg Laying Poultry
- Farm Marketing & Cash Farm Income Per Square Mile

Ranks 2nd in New England in:

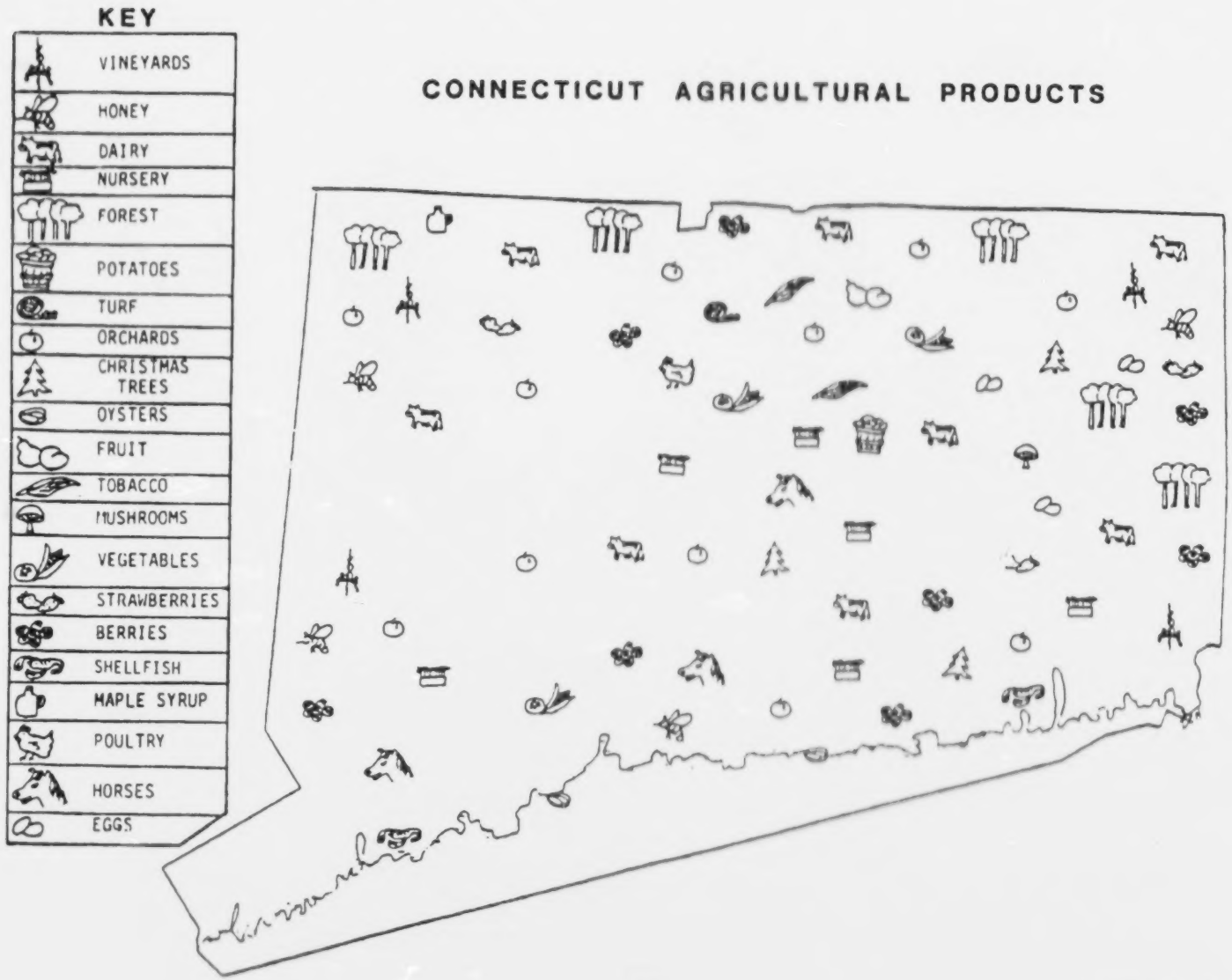
- Chickens for egg production
- Corn Silage Acreage & Production
- Egg Production
- Greenhouse & Nursery Sales
- Farm Equity
- Sweet Corn Production
- Cattle & Calves: Income *
- Milk Production & Value *
- All Cattle *
- Farm Value Per Acre
- Net Farm Income

** Per Square Mile*

Connecticut is a small New England state of 4,872square miles of land area. Maine, Vermont, New Hampshire and Massachusetts are approx. 7,2,1.6 and 1.6 times that size. Connecticut has approx. 3.28 million people. Relative geographic size needs to be considered if production is to be compared from state to state.

Connecticut Grown Crop Availability Chart

CROP	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Apples					X	X	X	X	X
Beans				X	X	X	X		
Bedding Plants	X	X	X						
Beets				X	X	X	X		
Blueberries				X	X	X			
Broccoli			X	X		X	X		
Cabbage			X	X		X	X		
Cantalopes			X	X	X				
Carrots				X	X	X	X	X	
Cauliflower			X	X		X	X		
Cucumbers				X	X	X			
Dry Onions						X	X		
Eggplant					X	X	X		
Honey	X	X	X	X	X	X	X	X	X
Lettuce			X	X		X	X		
Maple Syrup	X	X	X	X	X	X	X	X	X
Nectarines					X	X			
Nursery Stock	X	X	X	X	X	X	X	X	X
Peaches				X	X	X			
Pears					X	X	X	X	X
Peas			X	X					
Peppers					X	X	X		
Plums					X	X			
Potatoes					X	X	X	X	X
Pumpkins						X	X	X	X
Raspberries				X		X			
Scallions				X	X				
Shellfish	X	X	X	X	X	X	X	X	X
Spinach	X	X	X	X					
Strawberries			X	X					
Summer Squash			X	X	X	X			
Sweet Corn				X	X	X			
Tomatoes				X	X	X	X		
Turnips						X	X	X	X
Winter Squash						X	X	X	X
Christmas Trees								X	X



CONNECTICUT AGRICULTURAL PRODUCTS

Prepared by Diane Holowaty

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Play *Get Fresh*

See Lesson 1—Get Fresh for suggested activities

Christmas Trees

White Spruce and Douglas Fir are the most popular Christmas trees. Both are well formed, with short dark needles.

Christmas trees are a valuable cash crop because, once established, they need only a few days of care a year.

Early December is the best time for harvesting cut trees. Some tree farmers dig up the trees and wrap the roots and soil in burlap. Others use the choose-and-cut method of sale.

There are more than 400 growers in Connecticut and more than 4,000 acres of trees. There are 400,000 to 500,000 Christmas trees growing in Connecticut.

Red Oak

The red oak is a beautiful landscaping tree and a prized source of fine lumber. The wood is used in flooring and furniture and makes excellent firewood.

The oak produces acorns, which are popular with squirrels, birds, pigs, and—at one time—people. Acorns were an important source of flour for early Indians.

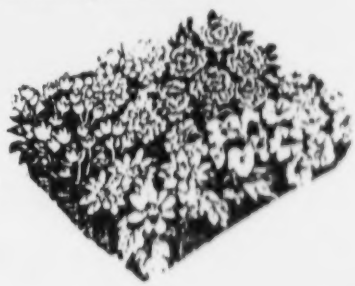
There is a strong demand for furniture and veneer-grade oak both in the U.S. and abroad. Red oak is the highest priced and most valuable of Connecticut's lumber. It grows easily and abundantly in the Connecticut forest.

Nursery Plants

Nursery plants are trees and shrubs used for landscaping homes and businesses. You might purchase a flowering dogwood tree or a maple tree at a garden center to landscape your home.

Bedding Plants

Bedding plants flower annually. In other words, they bloom once a year and then die. They also are called flowering annuals. Some examples of flowering annuals that you might grow in your home garden are petunias, marigolds, and zinnias. You may purchase bedding plants from a greenhouse.



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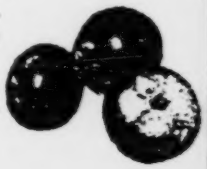
Apples

Apple trees are found growing throughout the U.S., but they did not always grow here. Apple seeds were brought to America by the first settlers.

Apples range in color from green to yellow and red. They have many uses and excellent keeping qualities.

Some apple varieties are Red Delicious, Macintosh, Cortland, and Winesap. Some varieties are better for eating raw, others for cooking, and others are excellent all-purpose varieties. There are many apple orchards in Connecticut because apples grow well in our climate.



Apples are high in Vitamin C.

Peaches

Peaches grow best in moderate temperatures. Along the Atlantic Coast, they grow from Georgia to Massachusetts. While some crops are grown in Connecticut, they are susceptible to damage by cold weather.

Peaches are white or yellow in color with a fuzzy skin. They are spherical in shape with a groove on one side, and a pit in the center.

Peaches bruise easily when ripe because they are very soft. They must be handled with great care.

Pears

There are many different varieties of pears. Some popular kinds are Bosc, Comice, Seckel and Anjou.

Pears range in color from green-yellow, to yellow with red-blush, to brown. They are eaten raw, canned, pickled or dried.

Melons

Melons are among the largest fruits in the berry family. Melons grow on vines which trail over the ground. Each year, new melon seeds must be planted to produce new vines.

Melons are best when eaten raw. They are never cooked or canned.

Some popular melons are watermelon, cantalope, honeydew, and cranshaw.

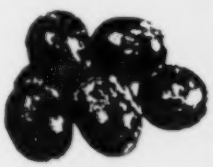
Since melons need a long growing season, only certain fast-growing varieties can be produced in Connecticut.

Plums

Plums are red, yellow, green, or blue to purple in color. The early settlers found plums growing wild in America. They discovered how delicious plum jellies and jams are.

Like peaches, plums have a large center pit. However, their skins are smooth and shiny.

The prunes you eat for breakfast are really large purple plums that have been cooked and dried.



Blueberries

Wild blueberries are picked and sold all over the world, but only in the U.S. and Canada are they cultivated.

The hybrid highbush blueberry is widely grown in Connecticut. Farmers have found ways to grow bigger and better blueberries. Blueberries grow in clusters on bushes and are harvested from July to September.

Blueberries are used for desserts, jams and jellies, or fresh in cereal. They are excellent frozen, canned, and baked in pies.

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Raspberries

There are several types of raspberries: red, gold, purple, and black. Raspberries and blackberries are known as brambles.

The canes on which they grow have many sharp thorns, although new thornless varieties are becoming available.

Raspberries are very fragile and perishable. They are best when eaten fresh or made into jams and jellies, pies, and desserts.

Strawberries

Strawberries are a deep, bright red color. They range in size from very small to over an inch in diameter. There are two types: June bearers and everbearers. There are about 30 varieties grown in Connecticut.

Strawberry plants grow low to the ground. Their black seeds can be seen easily. The seeds are in the pulp close to the skin.

Strawberries, rich in vitamin C, are eaten fresh or frozen and in jams and jellies. They are the most popular small fruit grown in Connecticut. Many farms allow people to pick their own strawberries.

Beets

Beets come in many different varieties. They may be a dark, almost purplish red to golden yellow color. Beets are a cool season crop.

They are an excellent source of vitamins A and C. People eat both the root and the leafy green tops.

Beets grow best in good sunlight and cool temperatures. Hotter temperatures cause the roots to become tough and woody.

Beets reach maturity in 65 days. They are excellent cooked, used in salads, pickled, or made into borscht, or beet soup.

Cabbage

Cultivated cabbage, as we know it, was developed from leafy, non-heading varieties that grew wild in Europe. Cabbage, cauliflower, and Brussels sprouts are members of the Brassica family of vegetables.

Red and white heading varieties are grown both as early- and late-season crops. The crop is usually transplanted from seedlings grown in flats or beds. Cabbage matures in 60 to120 days.

People enjoy cabbage both cooked and raw. Coleslaw is a salad made from cabbage. Cabbage also is processed into sauerkraut.

Sweet Corn

Sweet corn is a type of grass. It grows up to eight feet tall. It has a thick stem, with whorls from which large stems shoot out at intervals. The kernels are produced in ears, which grow from the joints between leaf and stem. The ears of corn consist of kernels tightly wrapped around a cob, covered in overlapping leaves called husks. A sweet corn plant usually produces one or two ears.

Sweet corn is the most important vegetable crop grown in Connecticut. About 500 acres are produced. Most of the corn grown in the state is used to make silage feed for cattle. Types of sweet corn include yellow, bicolor, and the new high-sugar types.

Carrots

Carrots are eaten both raw and cooked. One whole carrot eaten raw provides the complete recommended daily allowance (RDA) of vitamin A. An excess of carrot juice can cause the skin to become yellow.

Carrots come in many different varieties, both sweet and starchy. Some carrots are short and stubby. Others are over nine inches long. They mature in 60 to 75 days.

Rich sandy loam soils are preferred for growing carrots. Deep, well-tilled soil produces the best root growth.

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Cauliflower

Cauliflower has a circular, pure white head that is actually a flower. It is a member of the Brassica family.

Cauliflower is more difficult to grow than its cousin vegetables, cabbage and broccoli. It will not produce heads in very hot weather and cannot stand as much cold as cabbage. Also, special steps must be taken to keep the head, or flower, white. The leaves must be tied to shade the head. This is called blanching. A self-blanching variety of cauliflower also can be produced.

Cauliflower can be eaten raw or cooked. One serving of cauliflower contains 66 milligrams of ascorbic acid (vitamin C).

Cucumber

Cucumbers originally came from India. They are grown from China to Canada and, because of their short growing season (55 to 60 days from seed to picking), can grow almost anywhere.

Cucumbers grow best in soils that warm up fast in spring. They don't grow as well in heavy soil or cool sites. Plastic mulches can be used to increase yields and to hasten growing time.

Cucumbers come in a wide variety of shapes and colors. One cucumber, the lemon cucumber, is the size, color, and shape of a lemon.

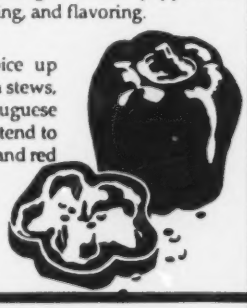
Cucumbers are popular salad and pickle vegetables.

Pepper

The pepper is a tropical plant, and thus it is a warm-season crop. Peppers thrive at 85 to 90 degrees F.

Peppers come in a great variety of sizes, shapes, colors, and flavors. They are classified as either sweet or hot. The sweet varieties are delicious for slicing, salads, and stuffing. Hot chili peppers are good for sauces, pickling, and flavoring.

Hot peppers also spice up Indian curries, African stews, and Spanish and Portuguese dishes. In the U.S. we tend to prefer the large green and red sweet bell peppers.



Spinach

Spinach is a hardy, cool-season crop, ideal for an early New England market. The optimum growing temperature is 55 to 60 degrees F. The crop matures in about 50 days.

There are two types of spinach: smooth leaf and savoy, or crinkled leaf. Both grow equally well in Connecticut, but the savoy variety is more diffcult to clean because of the crinkled leaf.

Spinach is rich in vitamins and minerals, especially vitamins A and C. It is enjoyed raw, in salads, or cooked as a vegetable. It is also used as an ingredient in quiches and other recipes.

Tomato

The tomato is a tropical or warm season plant. Because of its food value, many uses, and taste, it is the most widely grown and popular garden plant. Tomatoes are almost always transplanted. Seedlings are started in hotbeds or flats six to eight weeks before it is time to plant them outdoors. Tomatoes prefer full sun and rich, well-drained soil.

Tomatoes come in many sizes, shapes, and colors, from tiny red cherry tomatoes, to yellow pear-shaped varieties, to giant beefsteak tomatoes. They are versatile and used in all types of main dish and vegetable recipes. They are delicious sliced or in salads.

Broccoli

Broccoli is a member of the Brassica family. It is a hardy, fairly rapidly-maturing vegetable. It is grown as both a spring and a fall crop.

There are two types of broccoli: heading broccoli and Italian, or green sprouting broccoli.

Broccoli can be harvested repeatedly. After the first large center cluster of buds, or head, is harvested, smaller clusters will develop from the side shoots on the plant. This is particularly characteristic of the green sprouting variety.

Broccoli is eaten both raw and cooked and is an excellent addition to fresh salads.

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Squash

Squash is a native American plant. It grows well in many parts of the country. There are numerous types of squash. They are members of a large genus of climbing and trailing annual vines called cucurbits. Cucurbits include gourds, pumpkins, melons, cucumbers, and squash.

Summer squash matures quickly, in about 65 days. It has a soft rind. Zucchini and yellow squash are types of summer squash. Winter squash takes longer to mature—about 90 to 120 days. Butternut and acorn squash are types of winter squash. They have hard rinds and keep well in cool storage.

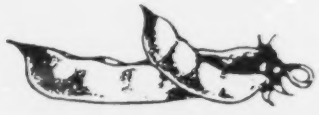
Squash should be planted when soil temperature is at least 60 degrees F.

Beans

There are many varieties of beans. They include snap beans, lima beans, dry beans, and pole beans. All of the varieties except lima beans are relatively easy to grow in Connecticut.

Beans should be planted in well-drained soil to reduce chances of disease, and they should not be planted repeatedly in the same field for more than two or three years because of soil-borne diseases.

Beans mature in 50 to 65 days. They are excellent sources of vitamins, minerals, and proteins.



Potatoes

The potato, known for its food value, is probably the most important crop in the world today.

Potatoes are grown from seed pieces or eyes. The tubers—the edible part—form on the tips of underground stems or stolons rising from the seed piece. The potatoes do not grow in the roots, but form above the seed pieces in these underground stems. Potato plants will form tubers without any flower development. The small fruits that develop from the potato plant flowers are not edible but contain seeds.

Potato tubers can be grown for various uses, such as baking or boiling. Some potatoes, called chippers, are grown to produce potato chips.

Mushrooms

The common mushroom is the only cultivated fungus used as food. Although more than 50 edible varieties grow in the wild, many wild species may be poisonous.

Mushrooms contain no chlorophyll.

In commercial production, mushrooms are grown indoors in a special mix of soil and compost. They are grown in a controlled environment in long-tiered beds.

Clams, Oysters and Scallops

Clams, oysters and scallops are shellfish. They are collected from Connecticut's coastal waters. Shellfish is sold live in the shell, shucked (shell removed) or cooked.

The shells of live clams, oysters, and scallops should be tightly closed or should close when touched. The meat is plump and creamy in color. The liquid inside should be odorless and clear.

Lobsters and Crabs

Lobsters and crabs are a type of crustacean. They have crust-like shells and segmented bodies. They are fished in Connecticut's coastal waters.

Lobsters and crabs are kept alive until cooked. The tail of a live lobster should snap back quickly after it is flattened out. This is a way of testing for freshness.

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Fish

Connecticut fish come from the ocean, lakes, and rivers. They are classified in two general groups: finfish and shellfish.

The finfish come from both salt and fresh water and have scales and fins.

Finfish contain less fat than red meat.

Honeybees

Honeybees are raised all over the world to pollinate food, seed, and fiber crops and to produce honey. In the U.S., bees pollinate $19 billion worth of crops.

The worker bees collect nectar from flowers. This nectar is changed into honey, which is pumped into the honeycomb for storage. The color and flavor of the honey depend upon the flowers from which the nectar has been gathered.

Connecticut has managed to maintain a disease-free environment for honeybees. If this environment can be maintained, Connecticut has great potential for providing bees to out-of-state breeders.

Tobacco

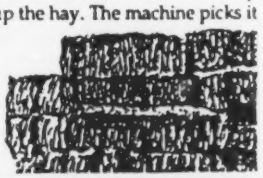
Tobacco is an expensive crop to produce and requires much hand labor. Tobacco seeds are tiny and must be started in flat boxes. Young plants then are transplanted to the field. The Connecticut River Valley is one of the few places where tobacco is grown under shade with netting stretched over the fields. Tobacco grows well in this rich, fertile, river-bottom land. The leaves of the tobacco plant are gathered and dried, with the best quality leaves used as outer wrappers for cigars. Connecticut is famous for the high-quality cigar wrapper tobacco leaves grown here.

Although the Surgeon General's office has repeatedly issued warnings about the health hazards of smoking, the consumption of tobacco products continues.

Hay

Hay is a good, cheap livestock feed when pasture or silage is not available. It is made by cutting and baling the top growth of green forage crops and drying it to a moisture content of 25 percent or less.

During haymaking, the farmer cuts the grass with tractor-drawn mowers and then leaves it on the ground to dry into hay. He rakes it into long rows with mechanical rakes, which consist of rotating wire wheels with prongs at the end. He turns the rows over periodically until the hay is thoroughly dry. Then it can be safely gathered without rotting. Sometimes the farmer uses an ordinary baling machine to pick up the hay. The machine picks it up, compresses it with a powerful plunger, and then ties it into oblong bales. A more modern hay collector produces large rolls of hay, not bales.



Pleasure Horses

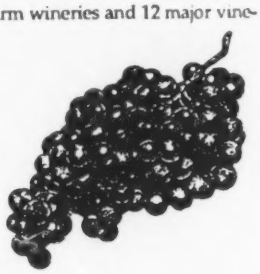
Horses are a big business in Connecticut, where there are more than nine horses per square mile. The raising of light horses for shows, racing, hunting and jumping competitions, parades, and pleasure riding is a multi-million dollar business. There are a variety of light horse breeds, each with special qualities, traits, and coloring.

The oldest continuous saddlemaking business in the United States is the Smith Worthington Company in Hartford. The largest manufacturer of horseshoe nails in the U.S. and the second largest manufacturer of harness hardware, bits, and spurs also are in Connecticut.

Wine

Studies have shown that Connecticut has the proper soil types, elevations, temperatures, and rainfall for successful wine grapes.

There are nine bonded farm wineries and 12 major vineyards in Connecticut.



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Sheep

Sheep and goats are closely related animals. Sheep are raised primarily for wool and their meat, which we call lamb and mutton.

The various breeds of sheep have different qualities of wool and meat, and differing abilities to thrive in a variety of pasture conditions.

Sheep are primarily grazers. Dogs often are trained to help the shepherd herd the sheep. The male sheep is a ram, the female is a ewe, and young sheep are called lambs.

Goats

Most goats in the United States are dairy breeds and are a source of milk, fine leather, and a meat called chevron. Angora goats are raised for their wool.

Goat milk is naturally homogenized, and has more fat and less lactose but the same water and protein content as cow milk. Many people who cannot digest cow milk can drink goat milk.

Goats are more curious and intelligent than sheep. Goats are natural browsers. Like sheep, they must be carefully managed so that they do not destroy the plants of their pastures.

The male goat is called a buck, the female is a doe, and young goats are kids.

Beef Cattle

Beef cattle are raised for the production of meat. Most beef cattle breeds originated in Europe. The male beef cattle is a bull and the female is a cow. The young are called calves.

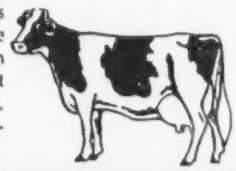
The beef cattle business can operate on a small scale or a large scale. In the Midwest and West, there are large operations with feedlots of 1,000 or more animals.

Here in the East, where there is less land, we focus on raising some of the purebred breeding stock used throughout the country. Breeding is important because it results in improvements in the industry.

Dairy Cattle

There are several breeds of dairy cattle. Holstein-Friesians are the largest dairy breed in Connecticut. This black and white cow produces the most milk of all breeds. Jerseys are small, brown, early-maturing cows. The brown and white Guernsey cow is average in size, temperament, and constitution. Guernseys rank second in number in Connecticut. Ayrshire cows are medium-sized and rather excitable. They are unsurpassed in foraging ability. The oldest of the breeds and one of the largest is the Brown Swiss. Brown Swiss cows are easy to handle.

After a cow has had a calf, milk is produced by glands located in her udder. The milk drains to the teat. From here, it can be squeezed out by the calf, human hands, or special milking machines.

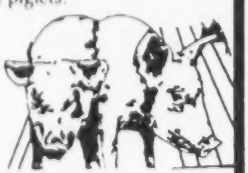


Hogs

New diets, scientific management, and crossbreeding help the hog producer raise a fast-growing, meaty animal with little fat.

Adult male hogs are called boars and females are sows. The young are piglets. Increasingly, pigs are being raised in easy-to-clean concrete pens. Sows with piglets sometimes are kept in narrow cages to prevent them from lying down and crushing the piglets.

Pigs are shipped to market at about 5 to 8 months old, when they reach a weight of about 220 pounds.



Poultry and Eggs

Poultry is a term that includes a variety of fowl kept for the production of meat and eggs. Chickens, ducks, geese, turkeys, and guinea fowl are all poultry.

In Connecticut, chickens are the most important meat birds, and chicken eggs dominate the market. Eggs are among Connecticut's chief agricultural products.

An adult male chicken is a rooster and a female is a hen. Baby chickens are called chicks.

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II. The Chicken and the Egg:

Introduction

Connecticut farmers produce 100% of the eggs consumed in the state. In addition, egg production accounts for 27% of the cash receipts from Connecticut farm sales. Yet many students are unaware of how eggs are produced, how modern egg production facilities operate, how eggs are transported or how eggs are marketed.

Objectives

Students will:
- Study egg production in Connecticut
- Discuss the grading and sizing of eggs
- Conduct a candling experiment

Background

Most of the eggs sold in markets come from large poultry farms, some of which have 100,000 hens or more. There are two types of poultry businesses. Chickens are raised as broilers for meat production or as layers for egg production.

The eggs we eat could never have hatched into chicks because they were not fertilized.

Connecticut and Maine are the leading egg-producing states in New England. Connecticut has more chickens per square mile than any ..ate in the nation. Kofkoff Egg Farms in Lebanon has more than 2,500,000 hens in production. The largest breeder of broiler stock in the world in headquartered in Glastonbury.

Classification standards are set by the U.S. Department of Agriculture to measure the quality and weight of eggs. Classification affects the pricing of eggs. The highest grade and largest eggs are the most expensive.

The largest size is called "Jumbo" and weighs 30 ounces per dozen. The smallest eggs are "Peewees" and weigh 15 ounces per dozen.

Only Grade A eggs are sold in Connecticut. Cracked or soiled eggs are sold to "breaking plants." There the eggs are pasteurized and processed into other food products.

The color of the shell may influence cost. Although there is no nutritional difference between brown-shell and white-shell eggs, brown eggs are the favored egg in New England.

The quality of an egg is determined by candling, which is done by placing the egg in front of a strong light beam in a darkened room. Twirling the egg in front of the light makes it possible to

Egg Production in Connecticut

judge the thickness of the white, the size and position of the yolk and the air pocket. This procedure is done by trained workers on high-speed assembly lines.

The highest quality egg, has a thick white—which supports the rounded, firm yolk—and a small air space.

Only top quality eggs are marketed to the consumer. When eggs are graded for quality and size, the carton has a label which indicates the quality grade and weight size of the eggs.

Although quality and size are both marked on the carton, one is not related to the other. Government inspectors keep a close watch on quality control and enforce standards and regulations.

Eggs are an important source of animal protein, minerals and vitamins, and they are low in calories.

Vocabulary

fertilized egg, yolk, eggshell, egg white or albumin, grade, size, candling

Materials

Newspaper advertisements
Student notebooks
Eggs
Cardboard tube
Flashlight

Procedure

The students will collect egg advertisements, visit a supermarket and compare eggs being offered for sale. They will:

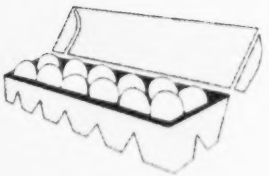
Record the grades, weights, sizes and prices of eggs; note the labeling and expiration dates

Compare the prices of brown-shelled and white-shelled eggs

Compare the prices of Grade A large eggs and Grade A medium eggs

Purchase a dozen eggs to bring back to class

After returning to class, students will examine an egg against a light source. Using a cardboard tube from a roll of foil wrap or waxed paper, they will place a flashlight at one end of the tube and an



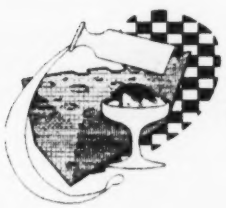
egg at the other.

After darkening the room, students will be able to locate and observe the air space and the yolk. Students might then break an egg on a plate to test the consistency of the white and the firmness of the yolk.

Going Further

The teacher will conduct an egg-dropping contest. Students will design packaging for a single raw egg that will allow it to be dropped from the top of a two- or three-story building without damage to the egg.

The class might hold an egg fest by preparing and serving the students' favorite egg recipes. The versatility of eggs and the nutritional value of different egg preparations then are discussed.



III. Farm to Market to Home:

Introduction

How do the products grown on Connecticut farms reach the consumer? How does the farmer prepare his products for shipping? How does the retailer present and preserve the products so that the customer is enticed to purchase them? In the following activity, students will trace the steps from the farm to the market and to the home.

Objectives

Students will:

- Learn about the production of milk
- Understand the processing of milk
- Learn how milk is shipped, where it is shipped and how it arrives on the grocer's shelves

Background

For the purpose of this study, students will take a look at Connecticut's dairy farming industry.

Milk is one of the most nourishing foods. We not only drink it, but also make it into butter, ice cream, cheese and yogurt. To produce the vast amount of milk we need, farmers keep large herds of dairy cows, which they milk two to three times daily every day of the year. Almost all milking is now done by machines.

On most dairy farms, cows are milked in specially designed milking parlors. The most common milking parlor in current use is the herringbone. In this parlor, the cows come and go in groups. Cows stand at an angle to the operator pit which is usually about 30 inches below the level at which the cows stand.

The cows enter separate stalls where they are supplied with grain to eat while being milked. Each stall is fitted with specialized equipment for milking. This machinery simulates the old method of hand milking. Suction draws off the milk and delivers it into a recording jar. A separate jar is used for each cow and a record is kept of the cow's daily milk yield.

The milk then goes through a cooler to help prevent spoiling. From there, it is pumped into a tanker for delivery to the dairy, which will pasteurize it to kill germs and then bottle it to make it into dairy products.

Vocabulary

homogenization, pasteurization, bacterial count,milking parlors, fortified milk

Materials

Notebooks

The Distribution of Farm Products

Procedure

Students will invite a Connecticut dairy farmer to visit their classroom. The students will prepare interview questions about the production of milk.

Here are some points students might focus on:

Since milk which is sold must be free of harmful bacteria, there are regulations designed to produce milk with a low bacterial count, good flavor, satisfactory keeping quality and nigh nutritive value. What steps does the dairy farmer take to meet the standards and regulations?

How is milk pasteurized? Homogenized? How long does it take for the milk to reach the grocery shelf? What steps are taken to maintain freshness?

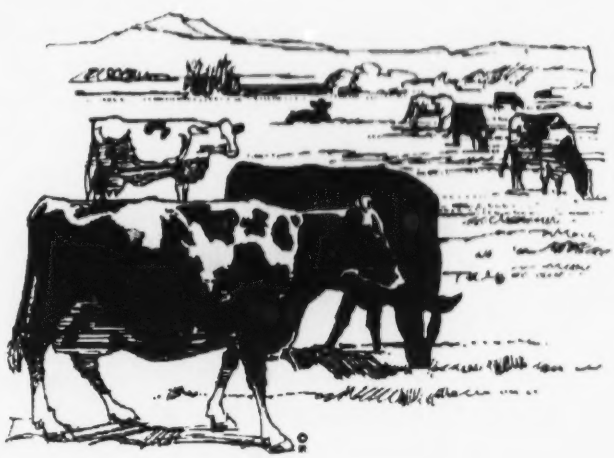
How is the milk packaged for shipment? To whom does the farmer ship the milk? How is it shipped?

How are prices established to the vendor? To the consumer?

Going Further

Students and teachers might create a bulletin board display illustrating the steps in the production, shipment, sale and consumption of milk.

The class might visit a grocery store to hunt for dairy products or bring in empty cartons of dairy products from home. The contents can be analyzed to determine if the product is made from milk or from an imitation dairy product. The nutritional value of milk products can be compared with products made with dairy substitutes.



Notes:

IV. Supply and Demand:

Introduction

One economic principle that has great impact on Connecticut agriculture is the law of supply and demand. When products are in great supply, the demand for the product lessens. When the supply decreases, the demand for the product increases.

Objectives

Students will:

•Study Connecticut products and determine how natural and man-made factors affect supply and demand

•Understand how media influences consumption

Background

Connecticut dairy farmers fulfill most of the state's milk requirements. According to the Dairy Division of the Connecticut Department of Agriculture, 65% of the milk consumed in Connecticut is produced in-state. 25% is produced in New York and 10% is produced elsewhere in New England.

One factor that affects the price of milk is the cost of trucking. The farther away the producer is from the consumer, the more is added to the price per gallon. For example, if the trucker must travel 250 miles to deliver milk, it probably adds about 10 cents to the cost per gallon. If the trucker travels 500 miles, the price per gallon probably would increase about 20 cents. If the shipping involved a 1,000 mile trip, almost 50 cents would be added to the cost. That is why, for economic reasons, it is advisable to produce milk as close to home as possible.

Vocabulary

supply, demand, media

Materials

Supply and Demand Scenarios (next page)

Procedure

The teacher and students read the Supply and Demand Scenarios and discuss the following questions for each scenario:

Do you think the supply of this product is going to go up or down?

What will hapen to the price?

Why do you think the price will change?

Would it matter if all the farms in Connecticut sold out and we didn't grow food here? Where would we get our food producrts? Would the food be as fresh?

Would it cost more? What factors would affect the cost?

What if all the famers in all the states turned their farms into shopping centers?

Food for Thought: 59

The Effect on the Price of Farm Products

Supply and Demand Scenarios

Scenario 1

An early, out-of-season frost hits Connecticut, destroying tomato, corn, pepper, lettuce and string bean crops. People still want the same amount of vegetables as they wanted before the frost.

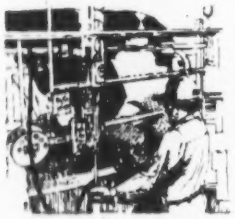
Scenario 2

Well-known scientists announce at a press conference that there is indeed truth to the old adage that "An apple a day keeps the doctor away." All the newspapers, radio stations and television stations feature the story. "Apples are an important source of vitamin C, and vitamin C can assist the body's immune system," said the group spokesperson.

Scenario 3

An usuaually long growing season produces one of the largest crops of sweet corn that Connecticut has seen in recent years. However, people still want the same amount of corn as they wanted in past years and no more.

Notes:



V. American Jobs:

Introduction

In 1920, the population of the United States was 106 million. At that time, there were 13.4 million farm workers supplying the population with agricultural products.

In 1985, the U.S. population had risen to 240 million, and only three million farm workers supplied the needs of the American people.

As food production becomes more technologically influenced, fewer Americans actually are employed on the farm and more are involved in grading, storing, processing, packaging, transporting and selling the food.

Objectives

Students will:

•Read the bar graph comparing U.S. population to the number of farm workers in a given year

•Understand how technology has lessened the need for large numbers of farmers, yet increased the numbers of workers in related, agriculturally-dependent fields

Background

From the work each farmer does to produce food, approximately nine other jobs are created throughout America. A University of Georgia study shows that for each $1 million farmers spend on livestock, machinery, buildings and other farming-related industries, more than 100 new jobs are created to service their needs.

American farmers have been spending more than $130 billion annually on materials and services for production. This results in millions of jobs in the steel, rubber, automotive and machinery industries. Production is stimulated for seed, feed, fuel, fertilizers and other agricultural products.

Vocabulary

value-added products, grading, storing, processing, packaging, transporting, support services

Materials

Handout:

Graph of U.S. Population Compared With Number of Farm Workers

Procedure

The teacher and students study the bar graph "United States Population Compared With Number of Farm Workers."

The teacher asks students to give the number of farm workers in a given year and compare it to the U.S. population for that same year.

The teacher might ask:

What percent of the population in 1920 were farm workers? In 1940? In 1960? In 1980? In 1985?

Why were there more farm workers in 1920 than in 1985?

How has America's changing society affected agriculture?

Food for Thought: 61

Agricultural Occupations

Why are fewer farm workers needed today than in 1920?

What are some agriculture-related businesses that exist now that did not exist in 1920?

Can you name some value-added products that you ate today?

What are some businesses that are not necessarily agricultural or agriculturally-related, but provide the materials and services needed for agricultural production?

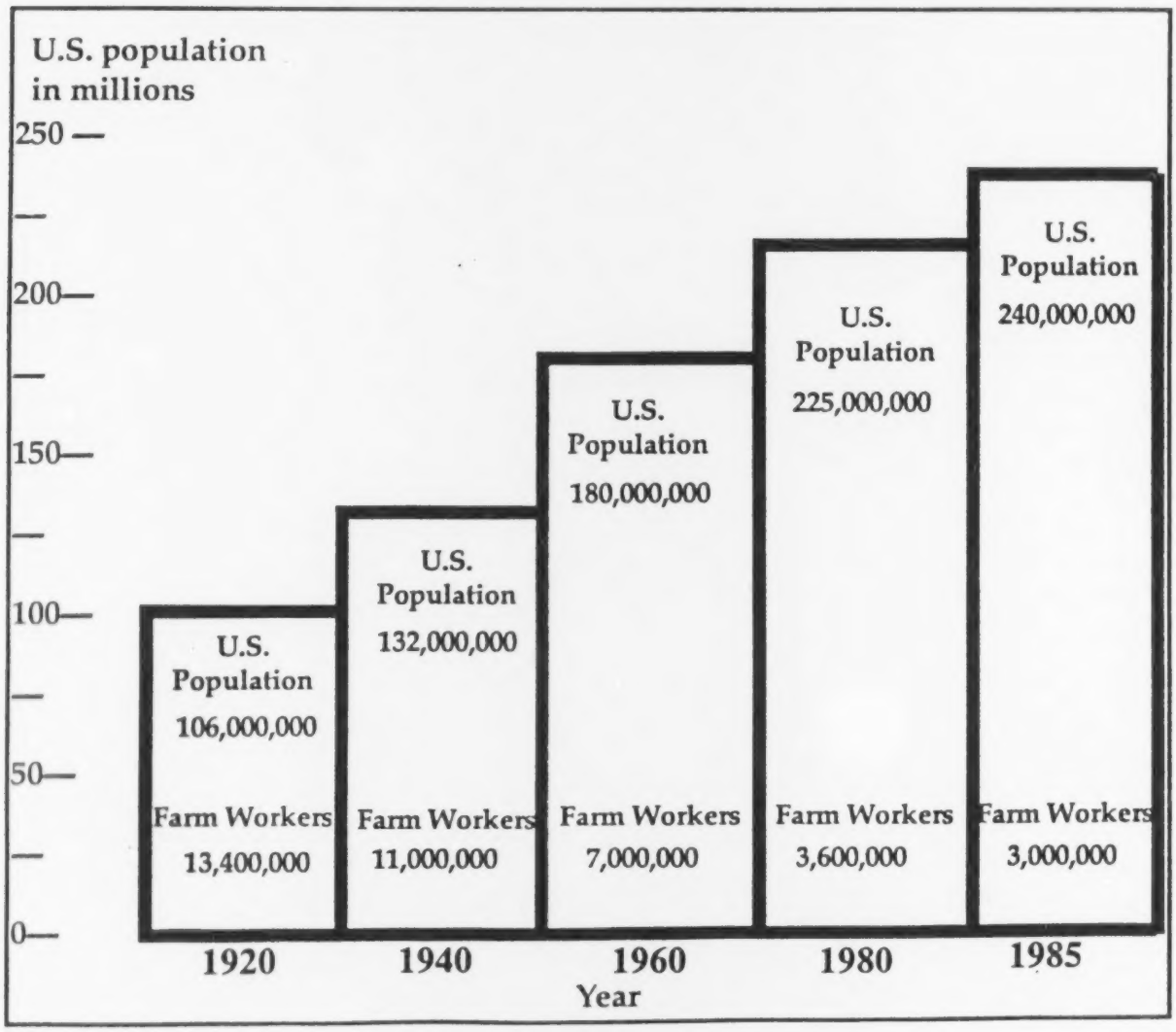
Students will brainstorm and research Connecticut jobs that are agricultural and agriculturally-related.

Going Further

Students might research and create a similar chart of comparative figures charting Connecticut population vs. The number of Connecticut farm workers.

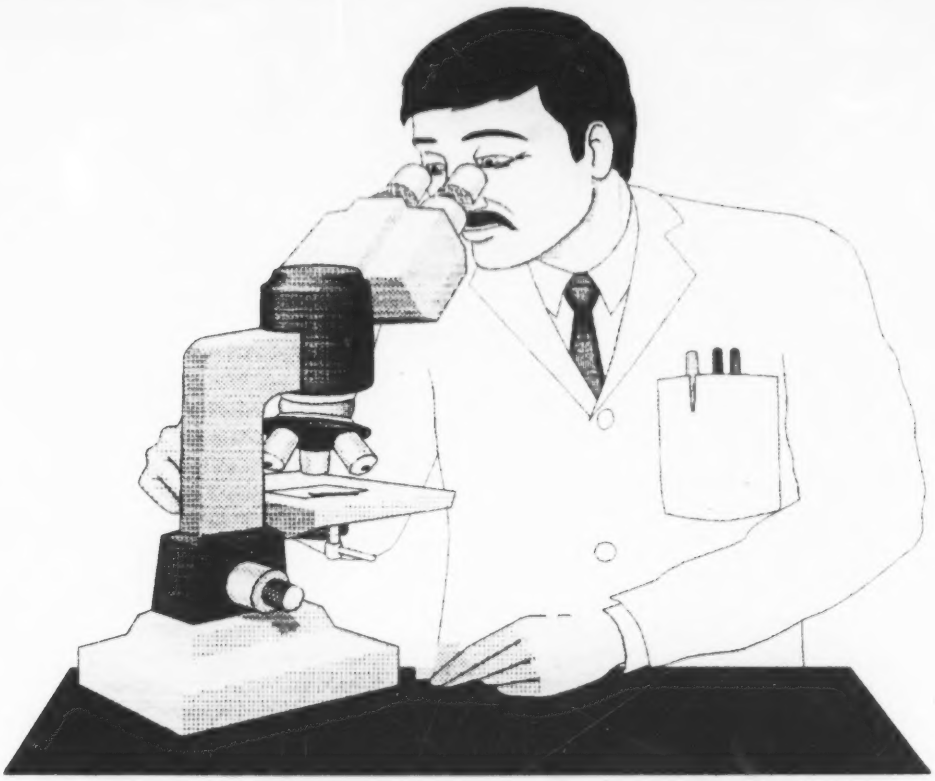
Notes:

United States Population Compared With Number of Farm Workers



Note: As population increases, farm worker numbers actually decrease.

Agriculture and Technology

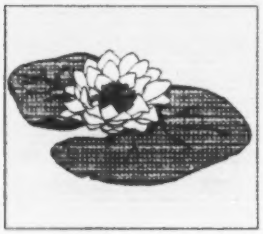


Square tomatoes. Nonfat meats. Low cholesterol eggs. Plants grown without soil. Space-age snacks. There will be changes in the food of the future, but even in a high-technology era, the staples of our diet will be produced by the farmer.

When you think of careers in agriculture, you may think only of the farmer plowing a field. However, there are job opportunities and career paths in agriculture in fields other than farming.

Today's farmer has to take advantage of new technology in order to survive economically and feed an expanding population. The United States needs 48,000 new college graduates in food and agricultural science each year to fill professional positions. Our nation currently has a shortage of food and agricultural scientists, technicians, managers and marketing experts.

Meeting the challenge of feeding a growing population will depend on the talents of skilled food and agricultural scientists.



I. The Tub Garden:

Introduction

Many young people are familiar with agricultural products that come from the land. Now the field of agriculture includes the farming of lakes, rivers and coastlines. This practice is called aquaculture.

One way to observe the fertile environment that water provides for plants and animals is to construct a tub garden.

Objectives

Students will:

- Create a miniature pond in a large container
- Observe the diversity of plant and animal life that grows in the pond
- Learn how maintaining a healthy environmental balance affects the plants and animals

Background

Aquaculture is the practice of growing plants and animals in water. The plants and animals are used for food and other products. Aquaculture can take place in fresh or salt water. It is regarded as one solution to the world's food supply problems.

In contrast to agriculture, which is practiced only on the land's surface, aquaculture can be used to grow several different crops in the same vertical region—near the water's surface, on the bottom and in the area between. Aquaculture is less affected than agriculture by extreme weather changes.

Fish are an important aquaculture crop. Cultivated fish account for about 10% of the total world fish consumption.

In Asia, farmers cultivate large quantities of seaweed for food. Important products of aquaculture taken from seaweed include agar, algin and carrageenin. These substances are used as thickeners or gelling agents in food, drugs and other products.

One-third of the annual worldwide aquaculture production is fish. Mollusks —clams, mussels and oysters—also account for one-third. Seaweed makes up one-fourth of all aquaculture production, and the remainder is crustaceans —shrimp, lobsters and crabs.

A farm fish pond, one acre in size, can supply up to 200 pounds or more of fish per year.

Connecticut is reclaiming its status as one of the largest aquaculture states in the United States. The abundant and shallow nutrient-rich waters of Long Island Sound are an excellent environment for shellfish production, providing pollution is adequately controlled.

All About Aquaculture

Aquaculture research is conducted at the National Marine Fisheries Services Laboratory in Milford as well as at the Sea Grant Marine Advisory Program, University of Connecticut Cooperative Extension System.

Aquaculture in the United States could quadruple by the year 2000, with Connecticut playing a key role. The Connecticut oyster industry is being revived and is now a regional leader in the production of seed oysters, producing the most valuable, high-quality oysters in the marketplace. Oysters rank first in landed weight of all commercial marine species harvested in Connecticut. Additionally, seed oysters are transported to New York and Massachusetts.

Although oysters are the only shellfish species for which significant aquaculture now occurs in the Sound, other native species are strong candidates for successful culture efforts in the future. These include the hard-shell clam, bay scallop, surf clam and blue mussel. The hard-shell clam is the second most valuable shellfish generated by Connecticut aquaculture.

Vocabulary

aquaculture, guppies, mosquito fish, algae, chlorination, acclimate, oxygen

Materials

One large tub, no deeper than 18 inches, with at least an 18-inch diameter
1/4 yard of sandy loam (from a garden center)
Aquatic plant fertilizer
Two bunches of oxygenating grasses
One water lily
Twelve water snails
Guppies or mosquito fish
One length of garden hose

Procedure

Students will:
Fill the container one-quarter full of sandy loam and add the correct amount of aquatic plant fertilizer for the volume of soil.

Slowly add water to a depth of one inch, being careful not to disturb the soil. A sock placed over the end of the hose will help disperse the water gently.

Plant the water lily in the middle of the tub; plant grasses around the outer edges.

Slowly fill the tub to the top with water. Place the unopened bag of fish in water for 20 to 40 minutes, then release the fish into the tub garden. This will slowly equalize the temperature and acclimate the fish.

The tub garden now will go through a natural process of achieving balance. The water should never be crystal clear. Small amounts of algae are necessary as food for the fish and snails and as nutrients for aquatic plants.

Balance will be achieved in the garden by allowing nature to take its course. Chemical controls are not necessary.

Tub gardens require three to four hours of direct or indirect sunlight each day, preferably during the morning or late afternoon hours.

For the first month or so, small amounts of water should be trickled into the tub garden from time to time. The minute amount of chlorine added in this manner will control the algae until the garden is balanced. The process will take 30 to 60 days.

If there is too much algae in the garden, the problem may be insufficient sunlight or too many nutrients. Problems can be prevented by giving the tub garden more sunlight or by pruning excess or old foliage and removing fallen leaves and twigs.

If the tub garden develops too much algae, more chlorinated water can be trickled into the tub and the water can be allowed to gently overflow for a couple of days.

Going Further

For more information on aquaculture, contact:
Sea Grant Marine Advisory Program, University of Connecticut Cooperative Extension System, Connecticut Department of Agriculture, Aquaculture Division.

II. A Bean Grows in Brick Dust:

Introduction

Most supermarkets now carry hydroponic vegetables. These plants look slightly different than vegetables grown in soil. Since they are grown indoors in a controlled environment, they are free of the bruises and deformities of soil-grown vegetables.

Objectives

Students will:

- Observe the effect of different substrates on plant growth
- See the relationship between nutrients and plant growth

Background

Hydroponics is the science of growing plants without soil. Good soil has the nutrients necessary for plant growth. Plants normally obtain nitrogen, phosphorous, potassium and other nutrients from the soil. These are needed for proper development.

In hydroponics, plants are grown in containers filled with water or with coarse gravel, sand or other substrate materials. These substrate materials do not contain the nutrients found in topsoil. All necessary plant nutrients are added to the containers. Hydroponic plants require the same amount of light and heat as conventionally-grown plants.

There are two main methods of growing plants in water: water culture and aggregate culture. In water culture, plants are suspended with their roots submerged in water that contains the proper nutrients. The roots absorb nutrients but do not anchor the plant, which must be suspended from above. Oxygen is also taken up by the roots and air must be regularly pumped or mixed into the nutrient solution.

In aggregate culture, the roots not only take up air and nutrients but also anchor the plant. The plants are not suspended in water, but placed in a substrate material such as sand, gravel, peat or vermiculite. A nutrient solution is then pumped up from below the substrate material or trickled down from above.

Farmers have found hydroponics to be useful for several reasons. Growing plants without soil is an effective way to study their needs and adjust the amounts of nutrients to achieve the best plant growth. More crops can be planted in less space. Although hydroponics is initially more expensive than traditional farming methods, it can be cost-effective later on. The cost of transporting harvested crops can be lowered because hydroponic gardening can take place closer to where food will be sold.

An Experiment in Hydroponics

Vocabulary

water culture, aggregate culture, nutrients, nitrogen, phosphorous, potassium, hydroponics, substrate

Materials

Green bean seeds
Nutrient-enriched hydroponic solution
Assorted aggregate substances, e.g., sand, gravel, vermiculite, peat, crushed brick
Small planting pots, one per student
Watertight plastic containers, deep enough for the planting pots to fit in
Watering can or pitcher
Paper towels

Procedure

After discussing hydroponics, the students will conduct a simple experiment. First, they will sprout several bean seeds in paper toweling soaked with nutrient solution.

Next, the students will place the sprouted beans in assorted aggregate cultures in the planting pots, one seed per pot. Each then will place a pot inside a watertight plastic container. They will thoroughly wet the aggregate substance with the hydroponic solution until the plastic container is half full.

For control, several seeds should be planted in potting soil and grown without hydroponic solution.

Every two to three hours, the pot will be lifted and the liquid allowed to drain into the plastic container. The plastic container is emptied into a pitcher or watering can. Students should place the pot in the container and rewater as in the step above. This will keep the aggregate moist with nutrient solution at all times. It also aerates the roots.

During the night, the pots can remain soaking in the solution.

Going Further

For more information on hydroponics, contact: University of Connecticut Cooperative Extension System.

Notes

III. Please Pass the Genes:

Introduction

Genetic engineering, while still experimental and somewhat controversial, offers possible solutions to food shortages and environmental problems. The applications are almost limitless. Research is being done to design plants that are resistant to disease, that kill insects and that debilitate certain weeds. Plants also will be engineered to be more nutritious, more responsive to fertilizers and easier to pack and transport.

Objectives

Students will:

•Understand how and why new varieties of plant and animal life are created

Background

Biotechnology is the development of products by manipulating natural biological processes. Intact organisms, such as yeast or bacteria, and natural substances from organisms, such as enzymes, may be used. Through biotechnology, living organisms are used to produce useful products. Scientific discoveries then are applied to new products to improve the quality of life.

Biotechnology may involve a technique called genetic engineering. Genetic engineering is a highly sophisticated method of cross-breeding and manipulation of plant and animal genes. Genes from one selected species are moved, with the help of a bacterial virus or plasmid, to another species. The selected traits are expressed in the offspring of the plant to which the genes were transferred.

For example, marigolds are naturally poisonous to some insects. By transferring to tomato plants the marigold genes which carry the codes for producing a substance poisonous to certain insects, scientists have eliminated the need to use certain insecticides on tomato plants.

The basics of cross-breeding were discovered by Gregor Mendel, an Austrian monk, in the 19th century. Mendel bred and crossbred thousands of garden pea plants, observing the characteristics of each successive generation. He was looking for a pattern in the inheritance of seven specific pairs of traits, including rounded or wrinkled seeds and tall or short plants. Mendel concluded that plant traits were handed down through hereditary elements we now call genes. If a plant inherited two different genes for one trait, one gene would be dominant and one recessive. Mendel published the results of his research in 1886. Although scientists have discovered some exceptions to his conclusions, most of Mendel's theories have been proven correct and now form the basis of our knowledge of genetics.

How New Plants Are Made

Some biotechnologists now use a process called tissue culture. In this technique, tiny slices of a given plant's tissue are grown in a sterile laboratory environment on a nutrient medium. This procedure allows the scientist to rapidly grow many genetically identical offspring from one parent plant.

Plant scientists at the Connecticut Agricultural Experiment Station pioneered work developing ornamental mountain laurel varieties using tissue culture. Mountain laurel, the Connecticut state flower, is an expensive, slow-growing plant which is difficult to propagate from seed, cuttings or other routine methods.

Tissue culture is currently being used most widely for propagating ornamental plants. Its advantages include time saved in growing a plant to market size, duplication of superior plants and economics.

There are many ways biotechnology is improving life and the standard of living for all people. Biotechnology is being used in the areas of human and animal health care, waste management, energy, chemicals and agriculture. Some of the current agricultural practices use inefficient technology. Biotechnology will result in improved, more efficient farming methods.

Agricultural use of biotechnology will result in improved food production. Plant science developments will result in dramatic changes in farming practices. Some examples are:

- Disease-resistant crops
- Plants that resist insect damage
- Crops that adapt to adverse conditions
- Plants that produce weed-controlling chemicals
- Plants that provide for their own fertilizer needs
- Food crops that are more nutritious

Animal science developments will provide improved efficiency in the raising of livestock, including:

- Health care products that cure disease
- Products that improve the production of meat and milk
- Enhanced genetic potential of livestock through genetic engineering
- Managing animal wastes to reduce environmental ills

Please Pass the Genes: How New Plants are Made

Vocabulary
genes, genetic, DNA

Materials
University of Connecticut Cooperative Extension System resource materials on cross-breeding and cross-pollination

Procedure
Students and teachers will discuss biotechnology—both the promise it holds for the future and some of the problems of tampering with nature. Students will begin this activity by writing a paragraph about their least favorite vegetable, called "What I Hate About _____." They will focus on texture, color, smell and appearance.

They will follow with a paragraph on how they might genetically engineer the vegetable to make it more desirable, naming the new vegetable they create.

Example
I hate spinach! It is slimy and blackish-green. It smells like grass and looks like seaweed.

If I could change those green genes, I'd definitely go to work first on the taste. I'd want it to taste like a cross between peanuts and popcorn. Next, I'd change that slimy, gooshy texture. I'd give it the crunchy texture of lettuce. Then I'd change the color. A few beet genes would make it a nice red color. I'll call my new vegetable Scarlet Popach.

Students then will design an ad for their new vegetable, introducing it to shoppers. The teacher will display the ads and essays on a bulletin board.

IV. Composting:

Introduction

Compost is a dark, crumbly and earthy-smelling form of decomposed organic matter. It improves soil and the plants growing in it. Yard wastes, such as fallen leaves, grass clippings, weeds and the remains of garden plants, make excellent compost.

Objectives

Students will:

- Examine the process of decomposition of organic matter
- Learn the principles of composting

Background

Compost improves the soil and the plants growing in it by returning organic matter to the soil. It improves plant growth by helping to break heavy clay soils into a better texture, by adding water and nutrient-holding capacity to sandy soils and by adding essential nutrients to soil. Improving the soil is the first step toward improving the health of plants. Healthy plants help clean the air and conserve the soil.

Anything that was once alive can be composted. Yard wastes, such as fallen leaves, grass clippings and weeds make excellent compost. The compost pile is really a teeming microbial farm. Bacteria start the composting process. They break down plant tissue and are also the most numerous and most effective composters. Fungi and protozoans soon join the bacteria. Then centipedes, millipedes, beetles and earthworms do their part. Carbon and nitrogen fuel this activity.

The more surface area the microorganisms have to work on, the faster the materials are decomposed. For a faster compost pile, chop the materials.

A large compost pile will insulate itself and hold the heat of microbial activity. Its center will be warmer than its edges. Organic matter composts faster in a hotter pile.

The microbes in a compost pile function best when the compost materials are about as moist as a wrung-out sponge and are provided with many air passages. Extremes of sun and rain can adversely affect the moisture balance in a compost pile.

In Connecticut, municipal leaf recycling became mandatory in 1991. Some farmers are interested in composting this leaf material.

Food for Thought: 73

Leafing Well Enough Alone

Mixed with manures and other organic wastes, the leaves can produce a usable, marketable soil supplement. The Mushroom Farm in Franklin, CT uses a carefully formulated compost to grow its crop. Other Connecticut businesses use compost as a basic commodity.

Vocabulary

organic, decompose, decay, recycle, humus, microorganisms

Materials

Wide-mouthed jar with lid
Soil
3 to 5 tablespoons of food scraps, including citrus peelings (no meat, bones or fat)
A few ounces of pond, creek or puddle water
30 leaves (any except black oak)

Procedure

Students are asked to fill a jar half full with soil and add food materials. The leaves are crumbled and added to the jar and contents are then mixed.

The mixture should be moist but not wet. Pond water is added as necessary. Pond water will contain micro-organisms not present in tap water.

The jar should be tightly covered and left in a dark corner.

Students observe what happens in the jar on a daily basis at first, then on a weekly basis.

Students may make charts to record what happens in the jar.

Notes:

V. Fighting Pests:

Introduction

Pesticide application has become more complex in the past few years. One reason for this is that the number of different kinds of pesticides has increased. Also, we are more aware of the harmful effects some pesticides have on wildlife and the environment. Integrated pest management (IPM) is one technique used by farmers to minimize pesticide use. IPM has important environmental and economic advantages.

Objectives

Students will:

•Determine the pest management options for a particular crop grown in Connecticut

Background

In the last 50 years, technological changes in agriculture have yielded dramatic increases in food production. The most significant changes include mechanization of farming practices, the development of new crop varieties and the use of synthetic herbicides, pesticides and fertilizers. Ninety-five percent of corn acreage in the United States is treated with herbicide. More than 750 million pounds of pesticides are used annually in agricultural production.

While a greater use of chemicals has contributed to the increased productivity of U.S.agriculture and to lower food prices, unforeseen side effects now are causing a reevaluation of their safety and effectiveness. For health, environmental and economic reasons, consumers and farmers are becoming wary of pesticides.

Environmental concern has motivated some farmers to reduce pesticide use, and market pressure for organic products is causing others to alter their production techniques. In addition, farmers have been faced with dramatically increased production costs. Many see reducing their expenditures on pesticides to be in their economic interest.

Integrated pest management is a plan for controlling and limiting damages caused by agricultural pests. Sometimes, two or more methods are used to control a pest. Natural enemies of the pest, such as predators and parasites, may be introduced into an infested area.

Also, numerous cultural methods have been found which help control some pests. These include insect lures, changing planting dates, rotation of crops or using plants that have a repellent effect on the pest. Cultural methods, natural enemies and careful use of selective pesticide are used for a successful integrated pest management program.

Food for Thought: 75

Integrated Pest Management

Connecticut entomologists are directing research and are training growers in new pest control methods. As a result, insecticides can be used discriminately at the most effective times and in smaller quantities.

The 1984-87 IPM impact study of Connecticut program participants showed a reduction of 36,412 pounds in pesticide formulation use.

State and federal laws are resulting in better-trained farmers and more thorough record keeping. Another benefit is the improved storage, use and disposal of chemicals. Pesticides being developed today degrade better and leach less. Problems of the past from highly toxic and long-lasting pesticides leaching through the soil into the ground are less likely to occur today.

Vocabulary

integrated pest management, pesticide, pesticide applicator

Materials

University of Connecticut Cooperative Extension System resource materials

Procedure

The class may be divided into small groups. Each group will choose a crop grown in Connecticut.

Students will assume the role of pesticide application managers. They will answer these questions:

What pests affect their crop? Do these pests have any natural enemies? Can an integrated pest management program be used? Would a change in planting dates or rotation of crops help control pests? What pesticide, if any, can be used on their crop? How many days after application of this pesticide can the crop be harvested? What effect does the pesticide have on wildlife, the environment and beneficial insects?

Each group will report its findings to the class.

Notes:

Building on the Past—

Technological advances in agriculture have made it possible for farmers to feed an expanding population. The mark of technology on the farm is evident in mechanized methods of harvesting. In 1920, there were 4,000 combines. Today that number has increased to 542,000. Thanks to technological advances, American farmers produce 76% more food than their fathers on the same number of acres.

Sophisticated farm machinery monitors the correct amounts of seed, fertilizers and agri-chemicals. Today's machines enable the farmer to get the crop planted and harvested quickly and efficiently.

Changes in farm animals already are taking place. Scientists and farmers are working to produce more productive, healthier animals. Dairy cows are being bred to produce more milk. Cows and pigs are being bred to produce leaner beef and pork. Chickens in the future will produce eggs that are lower in cholesterol.

Sustainable Agriculture

Scientists are exploring ways to make farming even more productive and less damaging to the environment. One of these ways is the introduction of sustainable agriculture. The central premise of sustainable agriculture is that agricultural production should be conducted in accordance with sound environmental practice. Resource conservation and environmental safety are important, as is farm profitability. Successful farm management is a critical component of sustainable, or low-input, agriculture.

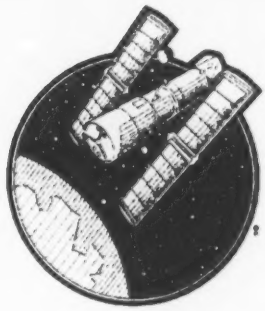
After decades of high chemical use, farmers are taking a new look at some of the methods of farming used by their predecessors. Crop rotation, the use of cover crops for conservation and the reduction of chemical use are examples of sustainable agriculture.

Biological and cultural approaches are used to manage pests and build soil fertility. Farmers practice crop rotation and the planting of legumes, which reduce the need for nitrogen fertilizer. Livestock provide fertilizer, consume crops grown during rotations and forage on fallow land.

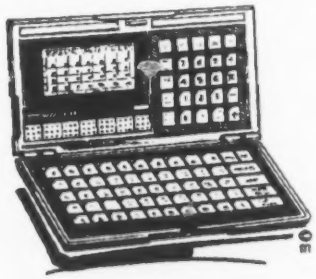
Sustainable agriculture returns to some of the cropping patterns and practices of previous agricultural systems, but it is not anti-technology. Rather, it uses and explores new technology that is compatible with environmental protection. The goal of sustainable agriculture is an agricultural system that meets our food needs and is profitable as well.

Connecticut agricultural agencies have embarked on a promotion of low-input techniques through demonstration projects. Some of the methods being used by Connecticut farmers include the use of new technology cultivators, the monitoring of insect populations and the testing of nitrate in the soil to determine when crop nitrogen applications are needed. Demonstrations done with assistance from the University of Connecticut Extension

Looking Toward the Future

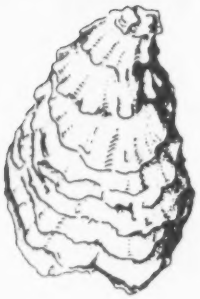


System educators have been successful at introducing these techniques to farmers throughout the state. Careful timing and management have resulted in good crop yields with reduced fertilizer and pesticide use.



Computers—A Valuable Tool for the Farmer

There will be many improvements in farming methods in the years ahead. One important aid for farmers already in use is the computer. Computers help farmers plan their crops by telling them the best time to plant and harvest in order to grow the largest and most nutritious crops. Computers also help the farmer reduce the use of pesticides by analyzing insect populations. Farmers then spray their crops only when needed. With computers, farming practices can be evaluated with conservation in mind. Soil erosion, fertilizer use and timing and chemical use can be precisely planned and better controlled. Livestock feeding can be fine-tuned, using computers to match the production of individual animals with their feed consumption patterns.



Farming the Sea:

Introduction

In Connecticut, fish, clams and oysters are raised in a farming practice known as aquaculture. Oysters require protected areas where farmers can provide a safe and food-filled home in which plants and young animals can grow quickly.

In an awesome example of recycling, oyster farmers spread a clean layer of old broken oyster shells on the bottom of a sheltered nursery area. There the farmer adds live oysters to provide enough eggs to start a new colony. Soon the eggs hatch, the young attach themselves to pieces of old shell or "culch" and begin their lives as little oysters called "spat".

Objectives

Students will
- Learn about Connecticut Oyster Farming
- Understand how water conditions effect oyster production

Background

Although the farming of the sea is a recent concept to most of us, oysters were being farmed on Long Island Sound in the 1700's.

Oysters were a dietary staple for New England Native Americans as they were for the European settlers who first came to the New World. By the early 18th century it had become necessary to create laws to protect oysters on Long Island Sound because of their rapid depletion. People who lived in the area began repopulating prime growing grounds with young oysters transplanted from far-away, more thickly settled beds.

By the end of the 1800's, oyster cultivating had become a way of life on Long Island Sound and Tallmadge Bros., Inc. was one among many oyster growers in the area.

But the days of unlimited oyster harvests could not last. By the early 1900's overfishing had almost eliminated the oyster from Long Island Sound. By the 1970's, storms, coastal development, pollution and the spread of parasites had seriously depleted the state's oyster fishery.

The story of oyster farming's comeback is an amazing one. Today, industrial waste has been reduced and sewage treatment plants that empty into tributaries and rivers leading to the Sound have been renovated. The turnabout has been the result, in part, of state clean water legislation along with the new federal Clean Water Act. This along with the work of the oyster farming industry in beginning a shell-spreading program that created clean, hard surfaces to which the oyster larvae could adhere has resulted in tremendous growth. Between 1987 and 1992, Connecticut logged a 1,200% increase in oyster production. Today's oystermen report harvests of one million bushels of oysters a year.

Food for Thought: 79

Amazing Oysters

Vocabulary
watershed, drainage basins, ecosystems

Materials
Handout:
Long Island Sound—A Treasure to Cherish
New England Map

Procedure
Oysters are part of a community or ecosystem that they share with many other species of plants and animals. Within this ecosystem oysters cooperate to create comfortable homes for sponges, moss-like animals, worms, other mollusks such as snails and mussels, and crabs. Passing fish feed on this diverse banquet.

How do we keep the waters of Long Island Sound healthy for oysters?

Present a map of New England and have students locate Long Island Sound and the many drainage basins which flow into it. The nine drainage basins of the Long Island Sound Watershed are:
the Connecticut River, Housatonic River, Thames River, South Central Coast, Southwest Coast (including Westchester County, NY), Pawcatuck River, Long Island, Southeast Coast and New York City.

Might an event in Quebec, Canada affect the oyster's ecosystem? Since water drains all the way from Quebec to the Sound, it is part of its watershed.

Have students brainstorm how they might make a difference in maintaining a clean Sound. The booklet, *Long Island Sound—A Treasure to Cherish* contains helpful suggestions and is available without charge from Northeast Utilities System.

Going Further
Field trip opportunities at ***Mystic Seaport, Mystic Marinelife Aquarium, Norwalk Seaport Association and Tallmadge Bros., Inc.*** provide excellent opportunities to learn more about oyster farming. Visit the Mystic Seaport website for additional information.
www.mysticseaport.org

A 44-page theme unit, *The Awesome Oyster—The Life and Times of the Oyster in Long Island Sound* by Penny Parsekian and an excellent videotape presentation on oyster farming are available from Mystic Seaport.

Notes:

BEST COPY AVAILABLE

Agriculture in the Classroom
Resource List

Agricultural Education and Government Resources

University of Connecticut, Storrs, CT 06269
College of Agriculture and Natural Resources
Office of the Dean, 860-486-2917

Department of Agricultural and Resource Economics, 860-486-3334

Department of Animal Science, 860-486-2637

Department of Natural Resources Management and Engineering, 860-486-2840

Department of Nutritional Sciences, 860-486-3633

Department of Pathobiology, 860-486-3736

Department of Plant Science, 860 486-2924

Cooperative Extension Centers

Bethel Extension Center
67 Stony Hill Road, Bethel, CT 06801
203-797-4176

Brooklyn Extension Center
139 Wolf Den Road, Brooklyn, CT 06234
860-774-9600

Haddam Extension Center
Box 70, Haddam, CT 06438
860-345-4511

North Haven Extension Center
305 Skiff St., North Haven, CT 06473
203-789-7865

Norwich Extension Center
562 New London Tpke, Norwich, CT 06360
860-887-1608

Torrington Extension Center
1304 Winsted Road, Torrington, CT 06790
860-626-6240

Vernon Extension Center
24 Hyde Avenue, Vernon, CT 06066
860-875-3331

West Hartford Extension Center
1800 Asylum Avenue, West Hartford, CT 06117
860-241-4940

Natural Resources Conservation Service

16 Professional Park Road, Storrs, CT 06268
860-487-4011

Thames Basin Office
139 Wolf Den Road, Brooklyn, CT 06268
860-774-0224

Coastal Basin Office
900 Northrop Road, Wallingford, CT 06492
203-269-7509

Connecticut River Basin Office
627 River Street, Windsor, CT 06095
860-688-7725

Housatonic Basin Office
1185 New Litchfield Street, Torrington, CT 06790
860-i626-8258

King's Mark RC&D Office
900 Northrop Road, Suite A, Wallingford, CT 06492
203-284-3663

Urban and Community Assistance Office
85 Willow St., Suite 10, New Haven, CT 06511
203-787-0390

Connecticut Agricult...al Experiment Station

P.O. Box 1106, New Haven, CT 06504
203-974-8500

Valley Laboratory, Windsor, CT 06095
860-683-4977

Connecticut Department of Agriculture

765 Asylum Avenue, Hartford, CT 06105
860-713-2503

Connecticut Farm Bureau Association

510 Pigeon Hill Road, Windsor, CT 06095
80-298-4404

Regional Vocational Agriculture Centers

Bloomfield High School Aquaculture Center, Huckleberry Lane, Blooomfield, CT 06002. (860) 242-0331

Bridgeport Regional Vocational Aquaculture Center, 60 St. Stephen Road, Bridgeport, CT 06605. (203) 576-7608

Housatonic Valley Regional High School Vocational Agriculture Center, Falls Village, CT 06031. (860) 824-5123 ext. 56

Glastonbury High School Regional Agriculture Center, 330 Hubbard Street, Glastonbury, CT 06033. (860) 652-7227

Killingly High School Regional Agriculture Center, 79 Westfield Avenue, Danielson, CT 06239-0210. (860) 779-6676

Lebanon Regional Vocational Agriculture Center, Lyman Memorial High School, 917 Exeter Road, Lebanon, CT 06249. (860) 642-7759

Ledyard Regional Vocational Agriculture Center, 24 Gallup Hill Road, Ledyard, CT 06339. (860) 464-9600 ext. 34

Wamogo Regional Vocational Agriculture Center, 98 Wamogo Road, Litchfield 06759. (860) 567-7428

E. O. Smith Regional Vocational Agriculture Center, 1235 Storrs Road, Storrs, CT 06268. (860) 487-0528

Middletown Regional Vocational Aquaculture Center, 370 Hunting Hill Avenue, Middletown, CT 06457. (860) 346-3564

New Haven Regional Vocational Aquaculture Center, 60 Water Street, New Haven, CT 06519. (203) 946-7106

Carl M. Small Regional Vocational Agriculture Center, 720 Pleasant Street, Southington, CT 06489. (860) 628-3229 ext. 352

Stamford Regional Vocational Agriculture Center, Westhill High School, 125 Roxbury Rd., Stamford, CT 06902. (203) 977-4974

Suffield Regional Vocational Agriculture Center, 350 Mountain Road, Suffield, CT 06078. (860) 668-3817

Trumbull Regional Vocational Agriculture Center, 72 Stroebel Road, Trumbull, CT 06611. (203) 452-5102

Rockville Regional Vocational Agriculture Center, Loveland Hill, Rockville, CT 06606. (860) 870-6197 ext. 43

Wallingford Regional Vocational Agriculture Center, Lyman Hall High School, 70 Pond Hill Road, Wallingford, CT 06492. (203) 294-5382

Northwestern Regional Vocational Agriculture Center, 100 Battistoni Drive, Winsted, CT 06098. (860) 379-9013

Ellis Clark Regional Vocational Agriculture Center, Nonnewaug High School, 5 Minortown Road, Woodbury, CT 06798. (203) 266-4038

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Ridout, Ronald and Holt, Michael. *The Life Cycle Book of Chickens.* New York: Grosset and Dunlap, 1974.

Russell, Solveig Paulson. *About Fruit.* Chicago: Melmont Publishing, Inc., 1962.

What's to Eat? And Other Questions Kids Ask About Food. The United States Department of Agriculture Yearbook, 1979.